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Buyer's Guide

2009

Quick Takes: Information Resource Covering The Newest Transmissions

A Closer Look at the Toyota U250E

Some Days Can Be a Real Drag

4L30E Pump Interchange

ATRA
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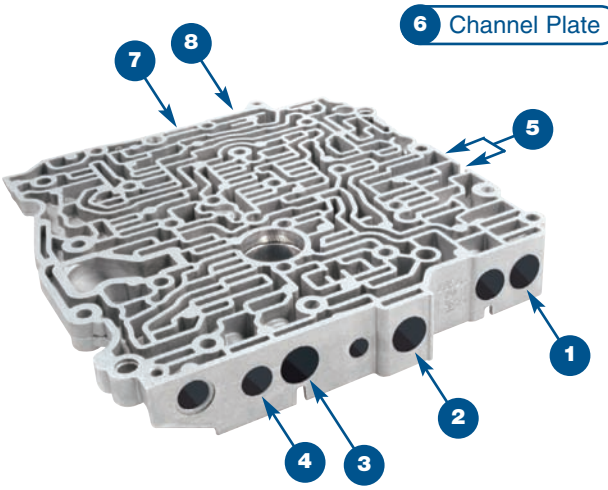

PROBLEM	SOLUTION
• Harsh reverse engagement • Soft upshifts, especially 1-2 • Low line rise, fwd or reverse	1 **Boost Valve & Sleeve Assembly** **84754-30K**
• P1811 Code • Poor or intermittent line rise • Slip/shudder condition	2 **Oversized Torque Signal Valve** **84754-44** 84754-TL44 Tool Kit Required
• Code 741 • No lockup • Falling out of lockup hot	3 **TCC Apply Valve Kit** **84754-43K**
• TCC slip • Code 741 • Ratio codes	4 **TCC Regulated Apply Valve Kit** **84754-34K** 84754-TL3 Tool Kit Required
• Delayed engagements • Flared 1-2 shift • Low reverse pressure	5 **Oversized 1-2 (Fwd) or Reverse Servo Boost Valve Kit** **84754-40K** 84754-TL2 & -TL4 Tool Kits Required
• Code 1811 • Maximum adapt or long shift • TCC slippage	6 **AFL Valve & Sleeve Kit** **84596-02K** F-84596-TL Tool Kit & VB-FIX Fixture Required
• Erratic or temperature-sensitive shifts • 2nd gear start • 2-3 shuttle shift • No 3rd or 4th gear • Anodized valves unavailable	7 **Shift Valves** **84754-36K** 2-3 Shift **84754-37K** 3-2 Downshift
	8 **Shift Valves** **84754-38K** 3-4 Shift **84754-39K** 4-3 Downshift

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January/February 2009

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Publications Mail Agreement No. 40031403
Return Undeliverable Canadian Addresses to:
Station A, PO Box 54, Windsor, ON N9A 6J5
Email: gears@atra.com

Issue #136 **Printed in U.S.A.**

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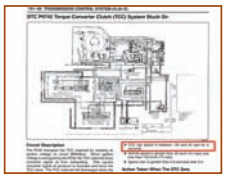
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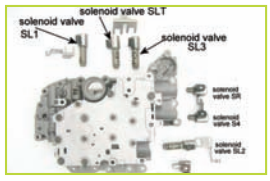

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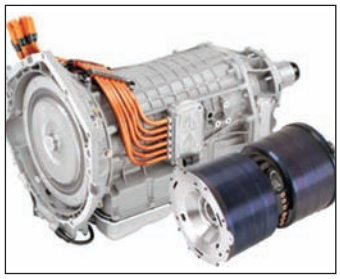
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It's Always Been about Business

by Dennis Madden

2008 was a bumpy year for many of us, that's for sure. It also was a milestone for ATRA: We learned that, as a trade association, there's a lot more to member benefits than fixing transmissions. Not that fixing transmissions doesn't remain at the core of the services ATRA provides; it is. But fixing transmissions is just a component of our true purpose: improving our Members' businesses.

You see, 40 years ago, being able to fix the transmission was the key to business success. So ATRA focused primarily on helping the industry fix transmissions, through technical seminars and a wide range of technical services. But this became a trap, forcing an identity on ATRA as being a "technical service provider." In most people's minds we were a hotline; we provided technical support.

Some people may see it as a question of semantics, but there's actually a distinct difference between being a technical service and being a service for improving business that also provides technical support.

The difference? Technical services remain fairly consistent regardless of trends in the market; they help you fix transmissions… nothing more. Business services change focus to accommodate changing market demands. As a business service, ATRA is constantly redefining itself to serve the needs of the industry.

This is just like the analogy we use when talking to shop owners about their purpose. Their shops aren't there simply to fix transmissions: Their *purpose* is actually to get their customers back on the road as efficiently as possible. Their *specialty* is automatic transmissions. When shop owners (or anyone else in your shop) think of themselves as transmission repair shops first, they limit themselves, even though the requirements of a specific repair may be identical.

Through the *What's Working* program, we identified three stages of the transmission industry over the past 50 years:

Generation I, which focused almost exclusively on being able to fix transmissions.

Generation II, which focused more on improving sales skills.

Generation III, which we call "creating a customer."

This is where we are today. Creating a customer has nothing to do with rebuilding transmissions, even for someone who specializes in rebuilding transmissions. Creating a customer is about *people*. It's about recognizing the needs of the consumer, and finding a way to meet those needs.

Shop owners who recognize that difference will do much better in this changing business climate than those still trapped in their rigid rebuilder's identity.

But the shops aren't the only ones who have to change their identity. ATRA is doing the same thing. Today's ATRA is much more than a hotline or technical service. Recognizing that gives us the freedom to provide the services that'll really benefit you… our Members.

The past two years have been a terrific experience for us: collecting data on consumer buying habits, finding out what successful shops across the USA and Canada are doing, networking with shop owners through the *What's Working* forum, and bringing that data to the industry, to help ATRA Members improve their businesses.

2009 will be a challenge for each of us. The dramatic changes taking place in the economy mean businesses may have to adjust the way they think of their businesses to meet the needs of their customers. And those economic turns will certainly affect the buying habits of tomorrow's consumers.

We must constantly challenge our purpose and alter our perceptions to make sure what we're doing meets the needs of the motoring public. This is a critical time for our industry, and one that must be addressed aggressively if we're going to survive and prosper.

This year, ATRA will continue to focus on the habits of successful shop owners and work to identify how consumer buying trends continue to change. This, along with continuing research on fixing transmissions will make sure that ATRA continues to provide the services to support its Members with their businesses.

It's all about business. But that's nothing new… it's always been about business.

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Whatever It Takes

Some Days Can Be a Real Drag

by Mike Souza

The call came in on a 98 Mercedes C230 with 722.6 transmission that had just finished being road tested… or so I thought. The first thing the tech said was the transmission felt like it had "a drag in 3rd gear."

I asked if he meant that it had a 2-3 bind and he repeated that it felt more like a drag. He said it was sort of binding but slipping at the same time, like a drag during the 2-3 shift. He said that during the two or three attempts to shift into 3rd gear the transmission would drop back to 2nd, then, every time after that, any time the transmission would attempt to shift into 3rd gear it would go to failsafe, as if there was no 3rd gear at all.

"Do you have any codes, and what type of scan tool software are you using?" I asked. I was pleased to hear that the scan tool he was using did indeed have Mercedes software, which makes these systems much easier to diagnose for two reasons: First, generic OBD-II codes retrieved by some aftermarket scan tools offer vague code definitions. In this case the only code that would likely set without Mercedes software would be P0700. The examples below for a generic code P0700 show why this could be a little confusing.

P0700	Transfer Case Control Module Communication Fault
P0700	Excessive Engine RPM
P0700	Excessive RPM Sensor 3
P0700	Engaged Gear Implausible (Trans Slipping)
P0700	Command Valve Stuck in Pressure Position or TCC Stuck On

The Mercedes definition for these P0700 codes would be:

41 or 137	Transfer Case Control Module Communication Fault
51 or 147	Excessive Engine RPM
49 or 145	Excessive RPM Sensor 3
52 or 148	Engaged Gear Implausible (Trans Slipping)
50 or 146	Command Valve Stuck In Pressure Position or TCC Stuck On

Why are there two-digit and three-digit codes? Codes between 2 and 65 are actual faults that are occurring when the codes were retrieved; codes higher than 96 are history codes — errors that occurred in the past. For example, a code 52 (in our case) that occurred previously would become code 148 because the computer would add 96 to the two-digit code. This is Mercedes strategy for determining actual errors with repeated faults.

The second reason for needing Mercedes scan tool software is there are no pressure taps on this transmission. To diagnose any slip issues you

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Figure 1

must monitor the data on the scan tool that addresses clutch slip. The TCM continuously controls *Shift Time Adaptation* during acceleration and deceleration. This is done by using a CVI (Clutch Volume Index) strategy — sounds familiar, doesn't it? These values are measured in Newton meters (Nm), with zero indicating that a clutch pack doesn't need adaptation or hasn't yet been adapted.

Maximum values in Nm would be:

- ±210 Nm for 8 and 12 cylinder vehicles
- ±180 Nm for 6 cylinder
- ±150 Nm for 4 cylinder vehicles

Maximum values would indicate an internal transmission problem.

The parameters that are most important to monitor can be found in the *Reset Adaptation Data* selection on the scan tool. These would be *Filling Time* and *Filling Pressure* for each shift. The Filling Time is measured in cycles (0-15 cycles); a filling time of more than 10 cycles indicates a problem in that clutch. Filling Pressure (measured in millibar) values in the negative range would indicate no problem in that clutch and won't affect shift quality; high positive ranges indicate an internal transmission problem.

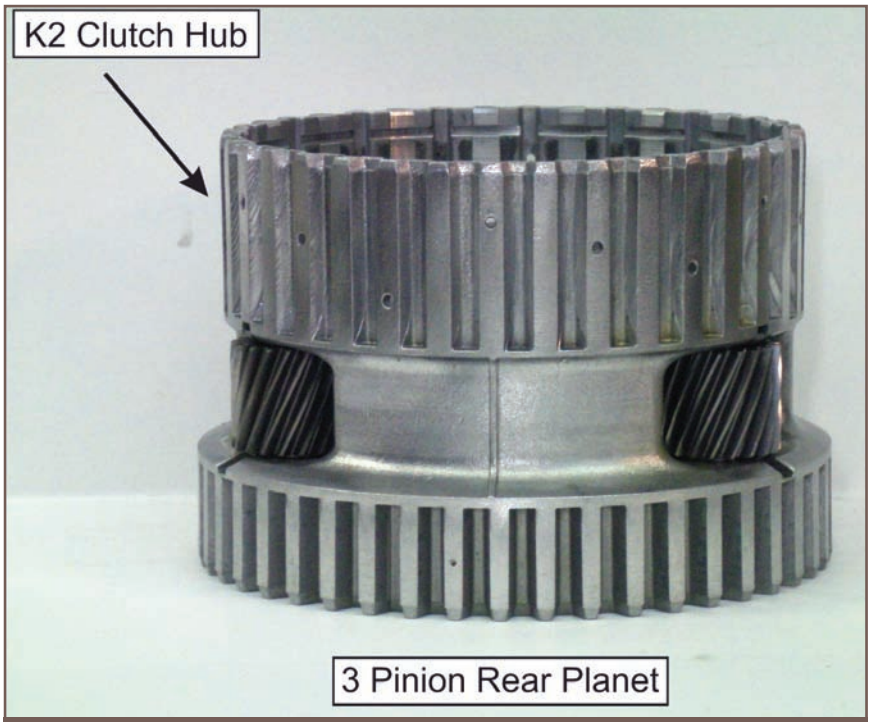

Figure 2

These ranges differ depending on which shift is being checked. For example, the 1-2 fill pressure range is 0-1600, while the 2-3 range is 0-800. The *Reset Adaptation Data* test displays as many as 24 transmission data parameters on some scan tools with the Mercedes software. As you can see,

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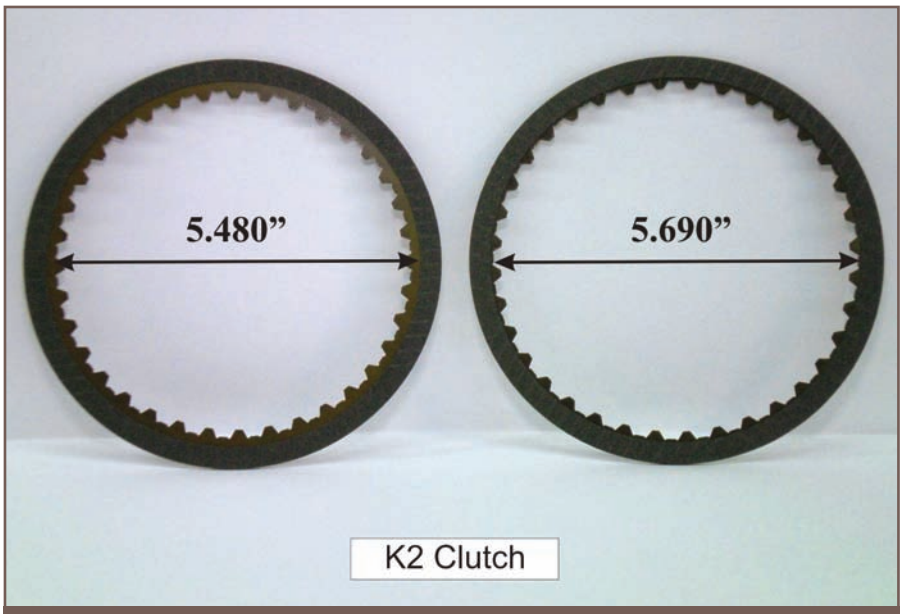

Figure 3

Figure 4

this type of information can shorten diagnostic time tremendously.

Getting back to our problem vehicle, the technician had already removed the pan and found a lot of aluminum particles — so much for the scan tool data. He then removed the valve body and air checked the clutch drums through the case. Everything seemed fine. His question to me was, “is there anything common that could cause these symptoms along with the material found in the pan?” I had to say it was a symptom I’d never encountered before.

So the next step was to remove the transmission and find the source of the aluminum particles. What he found was the K2 clutches (figure 1) had cut through the rear planet hub, which is made of aluminum (figure 2).

After doing some further research we discovered there are two different internal dimensions on the K2 clutch teeth: one measuring 5.480” and the other 5.690” (seen in figure 3). The inside diameter difference can easily be seen with the clutches placed one on top of the other (figure 4). The outside diameter and friction thickness on both K2 clutches remain the same, but the inside diameter changes due to the two different rear planetary hub diameters (figure 5).

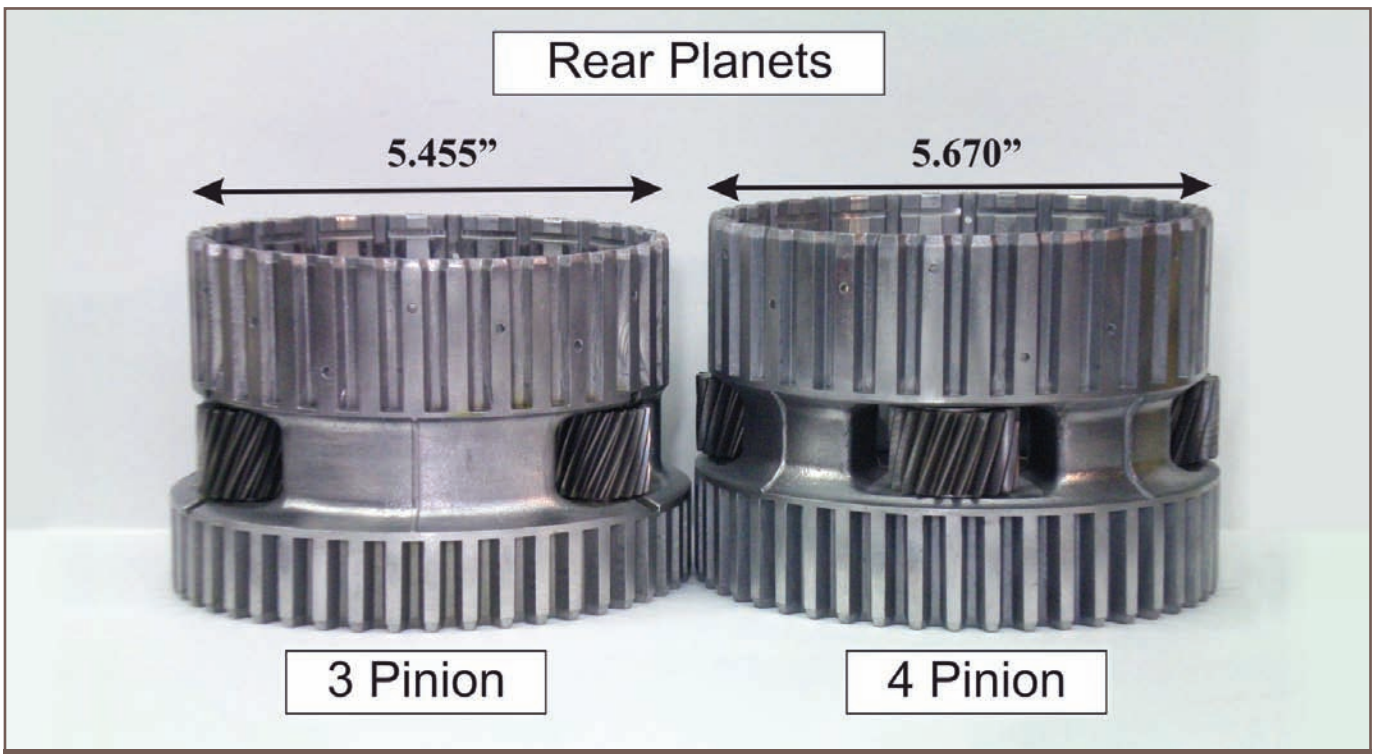

Figure 5

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When you place one planet on top of the other, the different dimensions are easy to see (figures 6 and 7), as opposed to placing them side by side.

When you place one planet on top of the other, the different dimensions are easy to see (figures 6 and 7), as opposed to placing them side by side. The hub diameter for the 3-pinion rear planet for transmissions behind smaller engines is about 5.455" as shown on the left in figure 5, which takes K2 clutches that measure 5.480". The 4-pinion planet for larger engines has a hub diameter 5.670", shown on the right in figure 5, and uses the larger internal tooth K2 clutches that measure 5.690".

When the clutches for the 4-pinion planet are installed on the 3-pinion hub, the teeth have very little contact (figure 8). The correct K2 clutch fit to a 3-pinion planet is shown in figure 9. This mistake will only take a few shifts before it will damage the hub, slip through 3rd gear, and go into failsafe.

This assembly problem is easy to miss because the clutch tooth fit on the planetary hub isn't something most people will check during a normal rebuild. Hopefully this will help someone else from making this mistake.

I'd like to thank WIT (Whatever It Takes) for providing the parts for the photos in this article. Here are their part numbers and the friction information:

- WIT P/N 78100A Friction, 722.6 K2 Clutch (0.085") 36 Teeth (6½" OD) 1996-Up (with small ID fits a 3-Pinion Rear Planet); quantity 6; Mercedes P/N 210-272-00-25
- WIT P/N 78100AA Friction, 722.6 K2 Clutch (0.085") 36 Teeth(6½"OD)1996-Up (with large ID, fits a 4-Pinion Rear Planet); quantity 6; Mercedes P/N 140-272-01-25

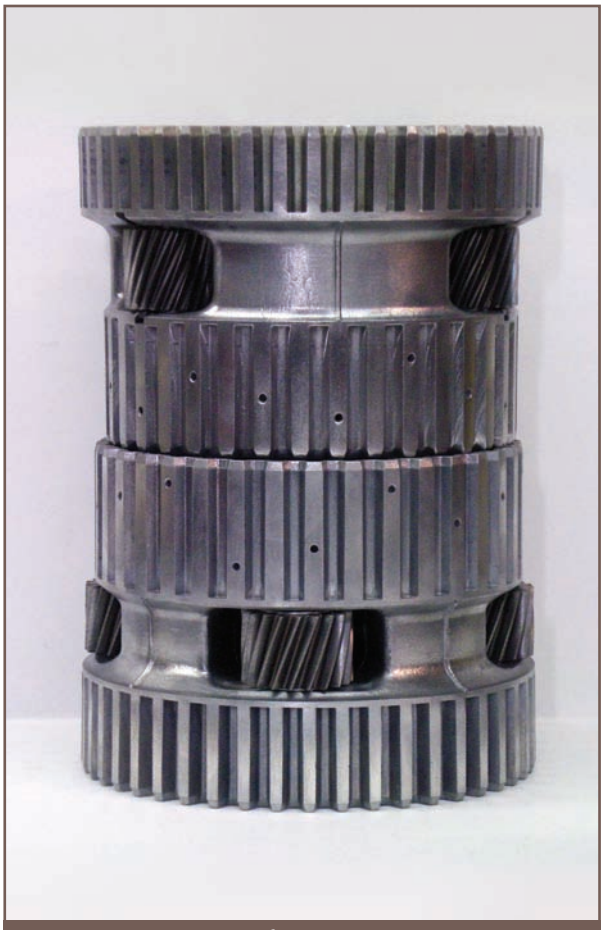

Figure 6

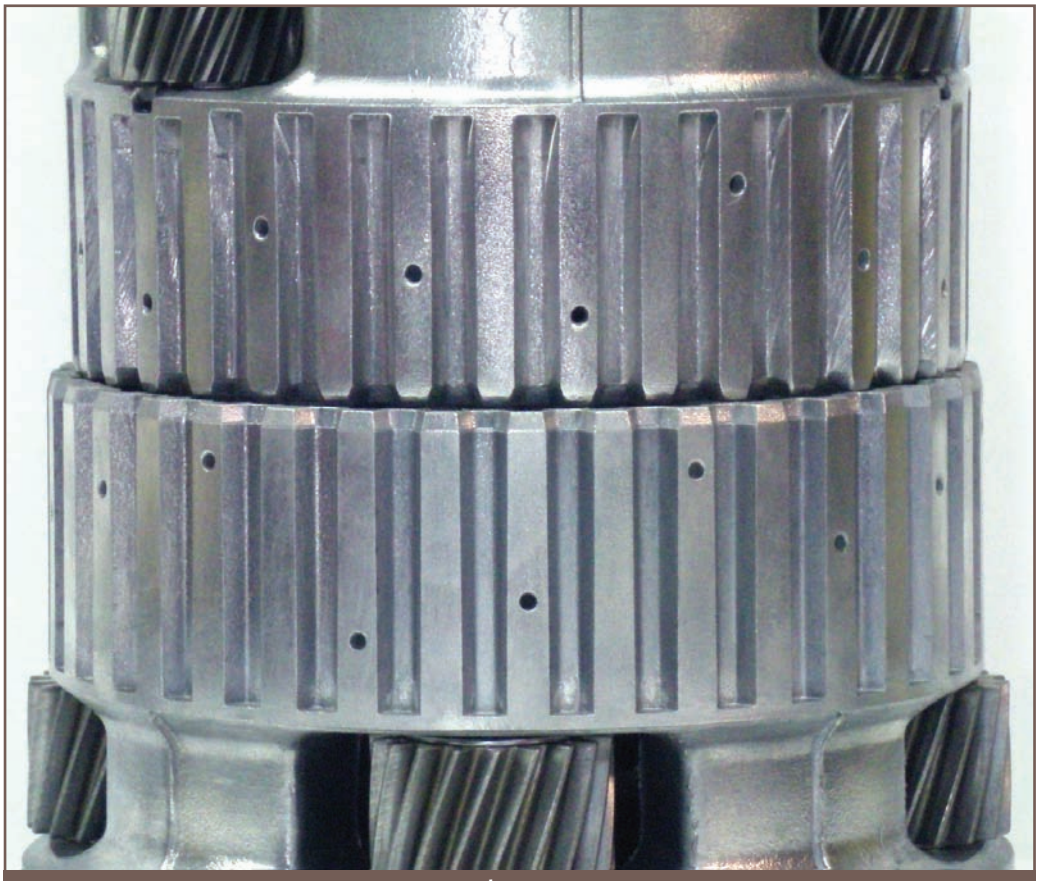

Figure 7

Figure 8

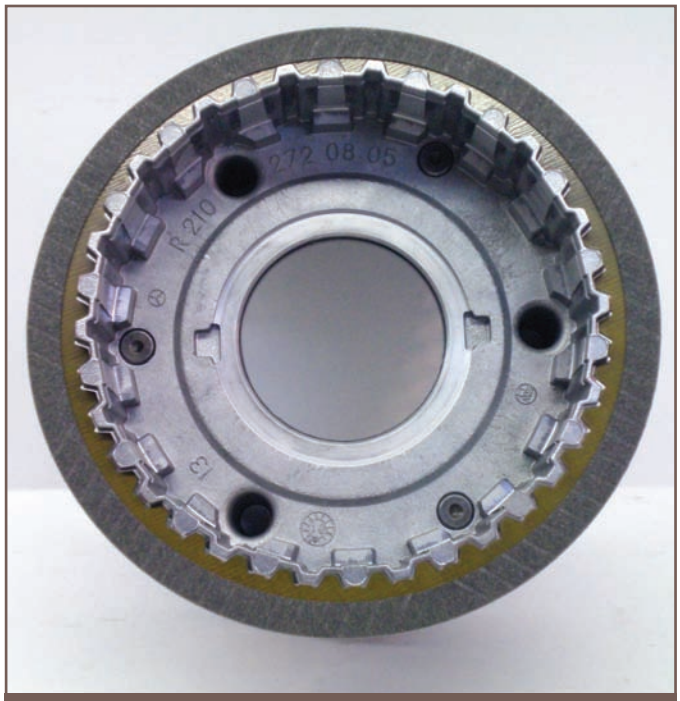

Figure 9

When the clutches for the 4-pinion planet are installed on the 3-pinion hub, the teeth have very little contact (figure 8). The correct K2 clutch fit to a 3-pinion planet is shown in figure 9.

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PLAYING WITH FIRE

4L30E Pump Interchange Part II: Ending a Myth

by Jon Rodriguez

Since the first edition of *Playing with Fire* in the July, 2008 *GEARS*, there have been a lot of questions about the interchange and whether it really works. Claims of too firm of a lockup apply, codes P0742, P1870, and a cycling lockup have been circulating through other well-respected technical firms. One suggested that the changeover could cause all four of these problems.

In this edition of *Playing with Fire* we're going to go into a little more detail about the system and show how this changeover works… when performed *correctly*. We'll address each of these concerns, one at a time.

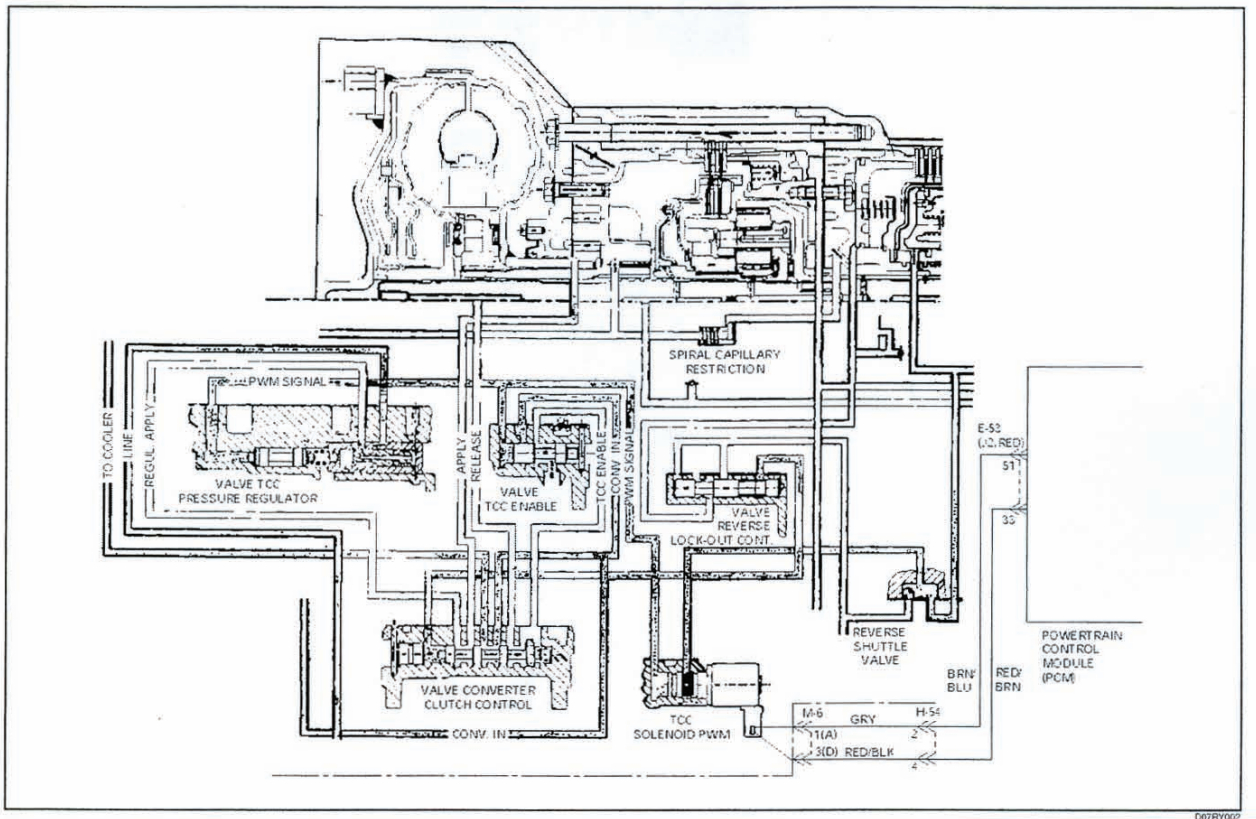
Complaint 1: Firmer TCC Apply

Starting with the firm TCC apply: yes, the apply will be firmer than the original setup, but not abnormally harsh… as long as you install the orificed checkball in the input shaft. The PWM version does not use the orifice Checkball to control lockup feel. The TCC apply can be brutal if you don't install the capsule. The apply will feel the same as an on/off setup in other 4L30E applications as long as you install the capsule. The firmer apply shouldn't become an issue as long as you inform the customer beforehand. Remember, you're doing this changeover for *customer* savings. Let them decide whether it would be worth doing.

Complaint 2: Code P0742

The next concern is a code P0742 — TCC system stuck off. Figure 1 shows the conditions that will cause the PCM to set code P0742 and is a copy from the 2002 Isuzu service manual.

DTC P0742 Torque Converter Clutch (TCC) System Stuck On



Circuit Description

The PCM energizes the TCC solenoid by creating an ignition voltage on circuit BRN/BLU. When ignition voltage is energized by the PCM, the TCC solenoid stops converter signal oil from exhausting. This causes converter signal oil pressure to increase and move the TCC valve. The TCC solenoid will deenergize when the PCM no longer provides ignition voltage. When the TCC solenoid is deenergized, it will exhaust fluid and release the TCC.

This DTC detects low torque converter slip when the TCC is commanded "off". This is a type "B" DTC.

Conditions For Setting The DTC

The following conditions occur once per TCC cycle, three consecutive times:

- No TPS DTCs P0122 or P0123.
- No OSS DTCs P0722 or P0723.
- No TCC solenoid DTC P1860.
- TP angle is greater than 20%.
- Engine speed is greater than 500 rpm and less than 3,000 rpm.
- Engine vacuum is between 0 and 70 kPa.
- Commanded gear is not 1st.
- Gear range is D4.
- TCC is commanded "off".
- No TCC Stuck off DTC P1870.
- TCC slip speed is between –20 and 40 rpm for 2 seconds.
- Vehicle speed is greater than 25 km/h (15 mph) and less than 120 km/h (75 mph).
- Speed ratio is greater than 0.9 and less than 2.0.

Action Taken When The DTC Sets

- For lamp illuminate refer to *DTC type definition (type B)*.
- Inhibit TCC engagement.

Conditions For Clearing The MIL/DTC

- The PCM will turn off the MIL and CHECK TRANS Lamp after three consecutive ignition cycles without a failure reported.
- The DTC can be cleared from the PCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warmup cycles without a failure reported.
- The PCM will cancel the DTC default actions when the fault no longer exists and the ignition is cycled "off" long enough to power down the PCM.

Figure 1

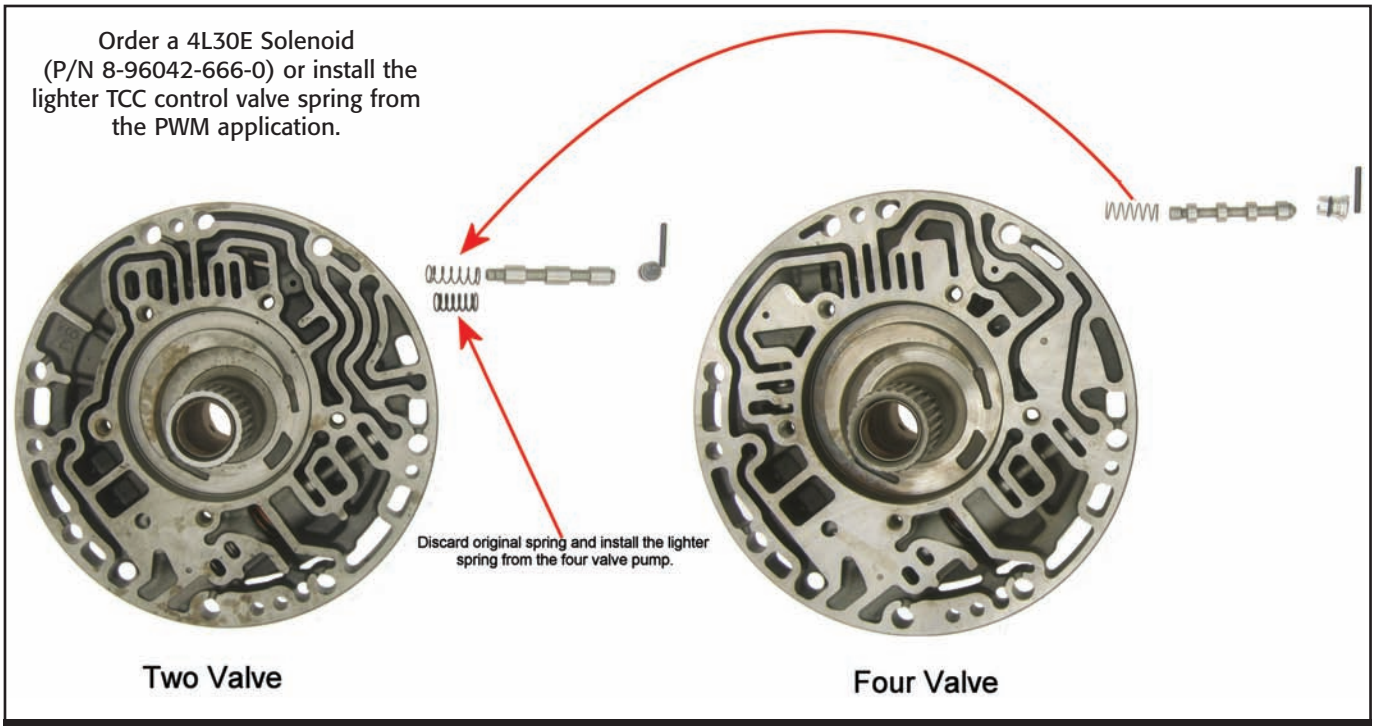

Order a 4L30E Solenoid (P/N 8-96042-666-0) or install the lighter TCC control valve spring from the PWM application.
Discard original spring and install the lighter spring from the four valve pump.
Two Valve
Four Valve

Figure 2

Of the 13 conditions the PCM is looking for — only the ninth and eleventh conditions have anything to do with command and slip speed:

9 — TCC is commanded off.

11 — TCC slip speed is between 20 and 40 RPM for 2 seconds.

In terms of this changeover, the code would occur if the PCM commanded lockup but the transmission didn't respond. We've found that this condition is due to a faulty TCC solenoid or pump, rather than the changeover itself. Treat this code as you would for unit that had not had the changeover at all.

Complaint 3: DTC P1870

Now let's look at the third complaint: DTC P1870 — transmission component slipping. Figure 3 was taken directly from the 2002 Trooper factory manual. It shows the criteria for P1870, and again, the changeover won't meet any of the necessary conditions for setting the code:

10 — TCC slip speed is between 250 RPM and 800 RPM, 3 times for 7 seconds.

13 — ECCC is on.

Provided that the converter, pump, and TCC solenoid are functioning properly this changeover eliminates the potential for TCC slip. Here again, look for faulty components rather than the changeover itself. We'll go into the *specifics* of this a bit later.

Complaint 4: TCC Cycling

This is by far the most common complaint and usually occurs at light throttle. Most of us have diagnosed P1870 codes in applications that are generous with data and have seen that normal TCC slip is 0-10 RPM with 40-70 percent duty cycle, depending on load and the integrity of the TCC circuit; the Isuzu application is no different.

This complaint occurs when the PCM commands a slip at low speeds and light throttle, but the converter releases entirely. The PCM responds by raising the duty cycle, reapplying the converter clutch, and then repeating the process. The root cause of this complaint is using a 4L80E TCC solenoid rather than a genuine 4L30E TCC solenoid.

The solenoids are the same resistance and fit without modification, but the flow characteristics are quite different under the same command conditions. It takes a higher duty cycle for the 4L80E solenoid to allow the same amount of flow under the Trooper's PCM signal. Many parts distributors carry the 4L80E solenoid as a replacement for the 4L30E, and it'll work fine in the earlier on/off units but **not** with the on/off changeover. Unfortunately we didn't discover this trend until after printing the first article.

So how can you avoid this condition? Order a genuine 4L30E solenoid from your local parts distributor. By the way, the OE part number is: 8-96042-666-0. Or install the lighter TCC control valve spring from the PWM application (figure 2). Either of these solutions eliminates the TCC cycling at light throttle.

To prevent this from being an issue with future changeovers, always install the lighter TCC control valve spring from the four-valve pump behind the TCC control valve in the two-valve pump. Adding this step to the changeover will allow you to use the 4L80E solenoid without any problems.

Many hours of research went into this article using information gathered from willing members to try this changeover, as well as my own time in developing this interchange. This changeover has been successful in dozens of cases prior to the original article, and continues to serve as a viable alternative to replacing a worn out PWM pump assembly with the over-priced replacement.

I hope this clears up any doubts you may have about this changeover, and find the information useful for building better units.

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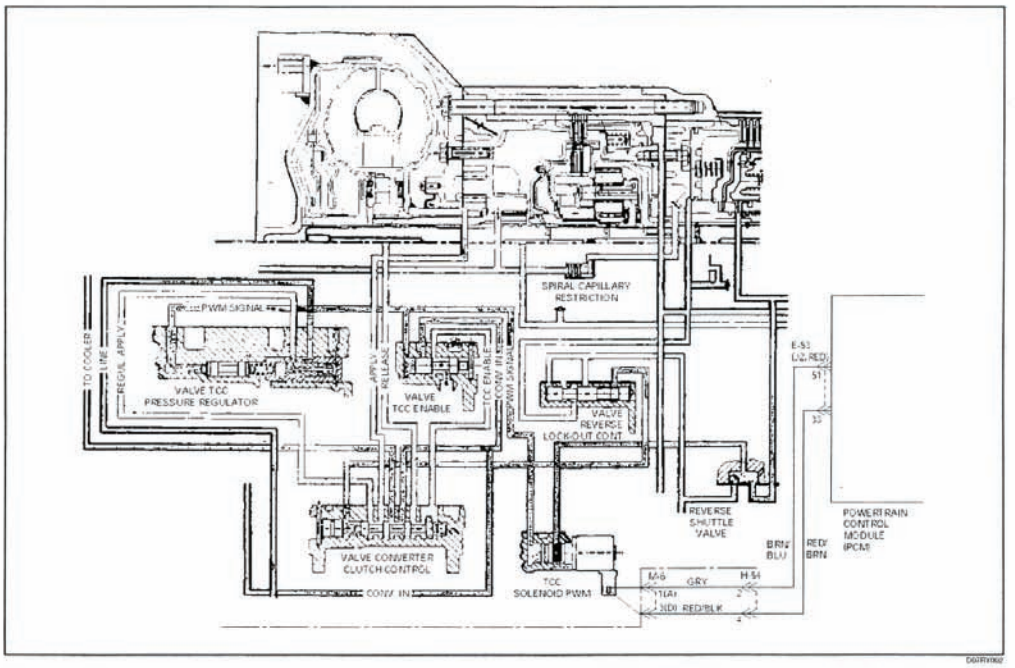
7A1–82 TRANSMISSION CONTROL SYSTEM (4L30–E)

DTC P1870 Transmission Component Slipping (TCC Stuck OFF)



Circuit Description

The PCM monitors the difference in engine speed and transmission output speed. For example in D3 drive range with the ECCC commanded, the engine speed should closely match transmission output speed. This DTC detects excessive TCC slip when the ECCC is engaged. This is a type "B" DTC.

Conditions For Setting The DTC

The following conditions are met for three TCC cycles with reported excessive TCC slip conditions.

- No OSS DTCs P0722 or P0723.
- No shift solenoid A DTCs P0751 or P0752 or P0753.
- No shift solenoid B DTCs P0756 or P0757 or P0758.
- No TCC solenoid DTCs P0742 or P1860 or P1870.
- Engine speed is between 1,000 and 3,500 rpm for 0.5 seconds.
- Gear range is D4.
- 13% < TPS < 99%
- 50 < Engine Torque < 300 N·m
- TFT is between 20° and 150°C (68° and 302°F).
- TCC slip speed is between 250 rpm and 800 rpm for 3 times 7 seconds.
- Vehicle speed is between 25 km/h (15 mph) and 225 km/h (158 mph).
- Speed ratio is between 0.6 and 0.95.
- ECCC is "ON".
- Low (0.8) < TCC Capacity < hi (0.99) for 5 seconds

Action Taken When The DTC Sets

- Only stored in memory.
- For lamp illuminate refer to *DTC type definition (type B)*.

Conditions For Clearing The MIL/DTC

- The PCM will turn off the MIL and CHECK TRANS Lamp after three consecutive ignition cycles without a failure reported.
- The DTC can be cleared from the PCM history by using a scan tool.
- The DTC will be cleared from history when the vehicle has achieved 40 warmup cycles without a failure reported.
- The PCM will cancel the DTC default actions when the fault no longer exist and the ignition is cycled "off" long enough to power down the PCM.

Diagnostic Aids

- Range switch malfunction could set a DTC P1870.
- A mechanical failure of the shift solenoids, TCC solenoid, or TCC PWM solenoid could set a DTC P1870.
- Internal transmission failures may set a DTC P1870.
- An intermittent or incorrect engine speed signal may set a DTC P1870.

Figure 3

FINDINGS: During my research for this article, I measured the amount of force necessary to move the TCC control valve to the locked position in both PWM and on/off applications. Both valves have identical surface area (0.12 square inches) on the control side, so the spring weight is the critical difference. The PWM TCC control spring has a working weight of 2.5 lbs; the on/off control spring is 4.5 lbs.

Based on these spring weights, the PWM needs 20.83 lbs of force to move the TCC control valve into lockup position; the on/off needs 37.5 lbs to shift the valve.

Then I measured the duty cycle controlling the TCC solenoid on a 2000 Trooper with a freshly-built transmission with a rebuilt converter. I used a graphing meter connected directly to the solenoid signal wires; it revealed full TCC occurred at around 50%.

I then used a solenoid dyno to test the flow characteristics of the PWM solenoid and found that, with 100 PSI of line pressure — which is normal cruising pressure for these units — it took 40% duty cycle to let 50 PSI reach the control valve. At 90 PSI, as stated in the original article, it took 45%. These percentages are satisfactory to the PCM programming and we've had several ATRA Members perform this modification with no problems.

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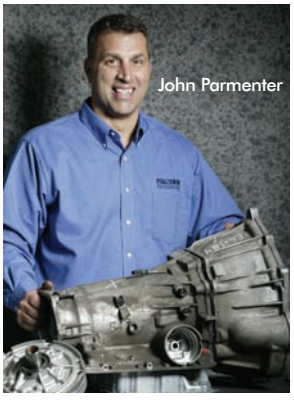

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STREET SMART

A Closer Look at the Toyota U250E

by Mike Brown

Toyota introduced the U250E 5-speed automatic transmission in the 2005 Camry with 2AZ-FE engines. It's a compact, lightweight and high-capacity 5-speed super electronically controlled transaxle that offers a higher overdrive ratio, a centrifugal fluid pressure canceling mechanism, and flex lockup control.

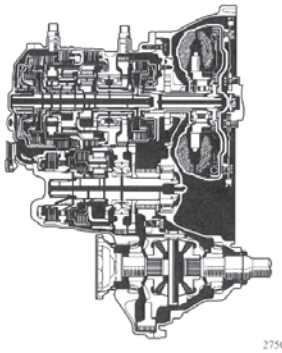
Looking at the chart (figure 1) you can see the gear ratio change: 1st, 2nd and 3rd are the same as the U241E used in the 2004 Camry; 4th and 5th are where the changes took place. Notice the differential gear ratio: The U250E has a lower differential gear ratio than the U241. That's what makes the U250E exceptional. Once in 5th gear, the overdrive ratio is 0.703 compared to the U241 4-speed's 1.020 ratio.

Centrifugal Fluid Pressure Canceling Mechanism

There are two reasons for the improvements to the conventional clutch:

1. Early units used a checkball to relieve pressure in the chamber behind the apply piston (chamber A), which would build up while the clutch was released due to centrifugal force. So before the clutch could be applied, the checkball would have to seat and the clutch apply chamber refill.
2. During shifting, in addition to the pressure controlled by the valve body, the rotation of the clutch drum would create even more pressure on the clutch through centrifugal force.

To address these conditions, a canceling fluid pressure chamber (chamber B) has been provided opposite chamber A (figure 2).



275CA52

U250E Automatic Transaxle

▶ Specifications ◀

Model		'05 Camry	'04 Camry
Transaxle Type		U250E	U241E
Gear Ratio*1	1st	3.943	←
	2nd	2.197	←
	3rd	1.413	←
	4th	0.975	1.020
	5th	0. 703	—
	Reverse	3.145	←
Differential Gear Ratio		3.391	2.740
Fluid Capacity Liters (US qts, Imp. qts)		8.0 (8.5, 7.0)	8.2 (8.7, 7.2)
Fluid Type		ATF Type T-IV	←
Weight (Reference)*2 kg (lb)		93.0 (204.6)	89 (195.8)

*1: Counter gear ratio included
*2: Weight shows the figure with the fluid fully filled.

Figure 1

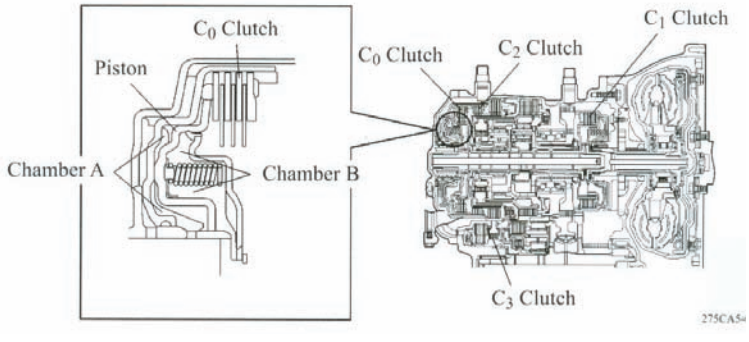


Figure 2

The flex lockup clutch control operates during deceleration in 4th and 5th gears in D range, and in 4th gear in 4 range.

By using the lubricating fluid from the shaft, the same amount of centrifugal force is applied to the opposite side of the piston, canceling the pressure created by centrifugal force that would apply the piston.

This addition eliminated the need to discharge the fluid through a checkball, resulting in a highly responsive and smooth shift.

Flex Lockup Control

Flex lockup control has been added to the conventional lockup timing control during deceleration. The flex lockup clutch control operates during deceleration in 4th and 5th gears in D range, and in 4th gear in 4 range.

The chart (figure 3) shows the flex lockup operating range. Figure 4 shows what the ECM and TCM are monitoring for flex lockup control.

Valve Body

The valve body assembly consists of the upper and lower valve bodies and 7 solenoids (figure 5).

Figure 6 lists the name of each solenoid used in the U250E transmission as well as the part name description provided in the electronic parts catalog.

The main thing you'll want to keep an eye on is the valve body. Toyota doesn't print checkball locations, so if one is missing or you drop one, this information will come in handy.

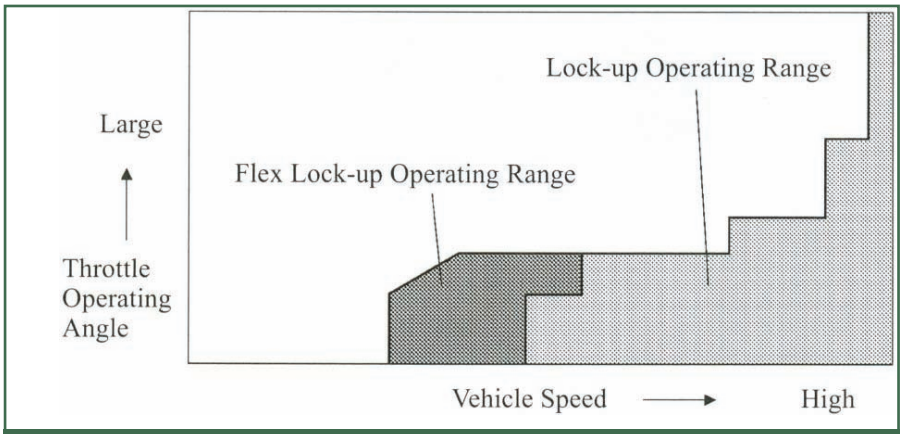


Figure 3

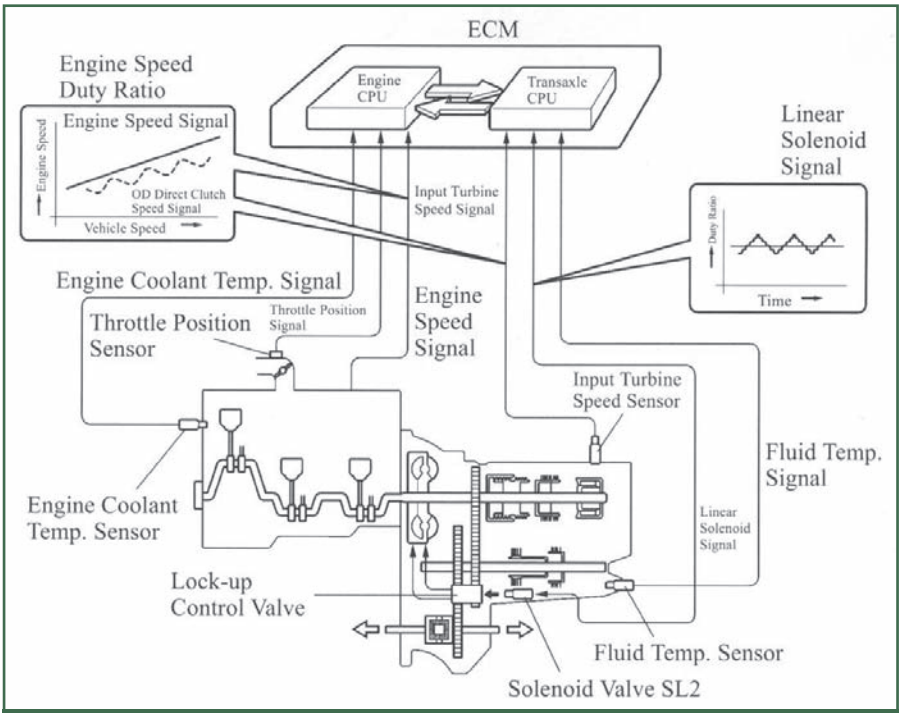


Figure 4

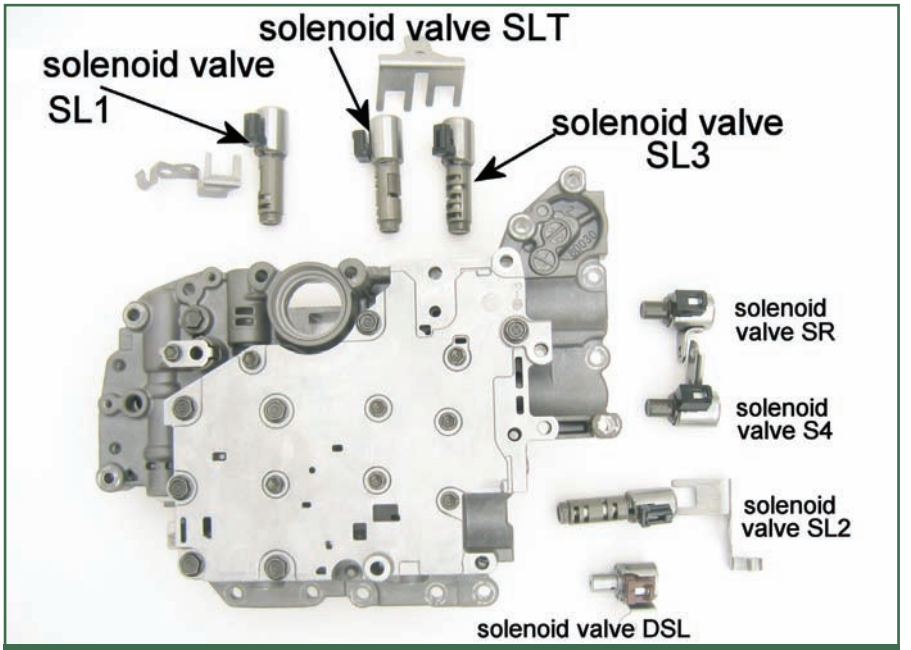


Figure 5

REPAIR MANUAL SOLENOID NAME	PART CATALOG DESCRIPTION
SL1	Solenoid Assembly, Clutch Control No. 1
SL2	Solenoid Assembly, Clutch Control No. 2
SL3	Solenoid Assembly, Clutch Control No. 2
S4	Solenoid Assembly, Transmission 3–Way No. 2 (No. 1)
SR	Solenoid Assembly, Transmission 3–Way No. 2 (No. 2)
SLT	Solenoid Assembly, Line Pressure Control
DSL	Solenoid Assembly, Transmission 3–Way

Figure 6

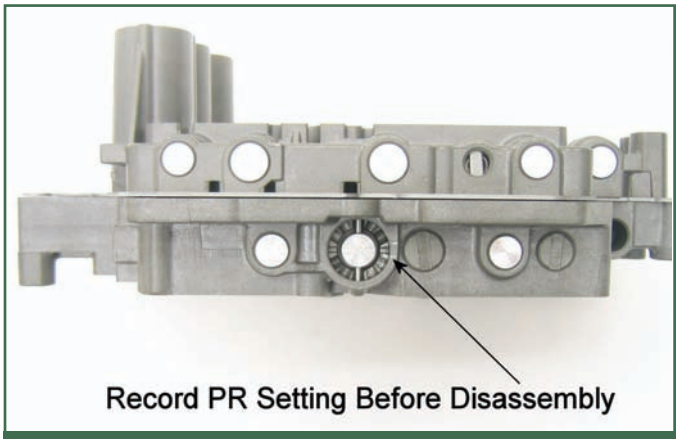


Figure 7

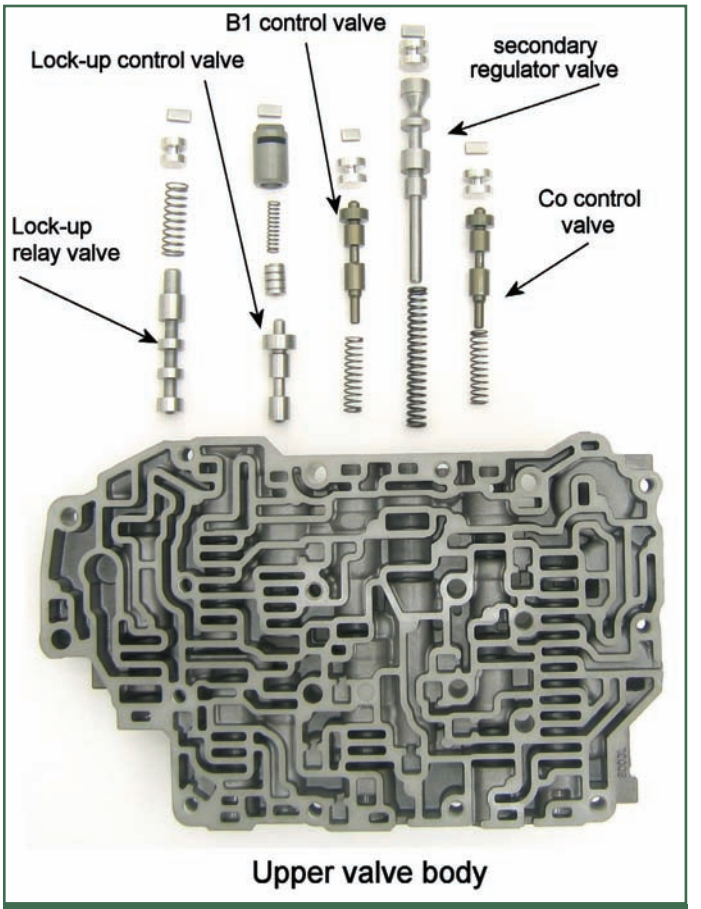


Figure 8

CAUTION: Before disassembling the valve body, record or mark the pressure regulator setting (figure 7). There are no factory settings for this valve; it's model-dependent, and will vary from vehicle to vehicle.

Valve Body Disassembly

As with any valve body, there are a few common practices you should keep in mind:

1. Always inspect the valves and springs thoroughly during disassembly.
2. Check the valves for scoring and make sure the valve bore is clean.
3. Pay close attention to the valve layout and make sure you put the valves back together the way they came out.

Upper Valve Body Side 1
(see figure 8)
Upper Valve Body Side 2
(see figure 9)
Lower Valve Body
(see figure 10)

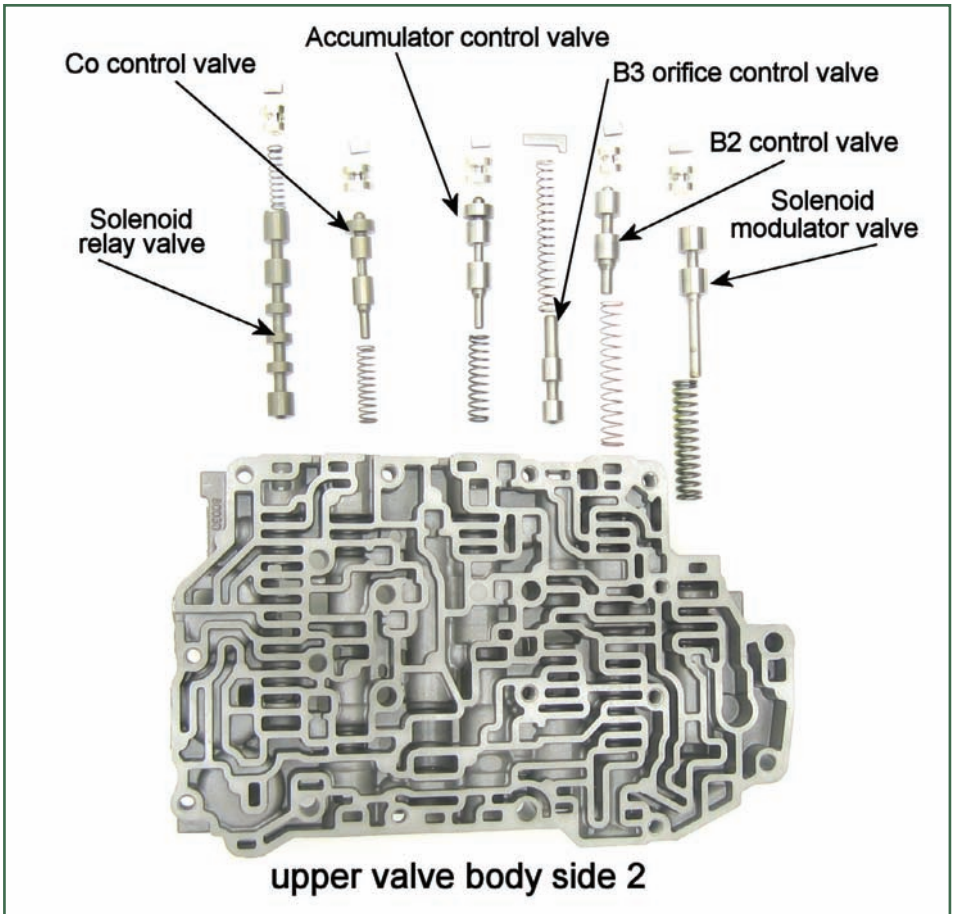


Figure 9

One very important thing to remember is that the U250E requires

ATF WS

Checkball Locations

There are 3 large steel checkballs in the upper valve body (figure 11), and 11 small checkballs in the main valve body (figure 12).

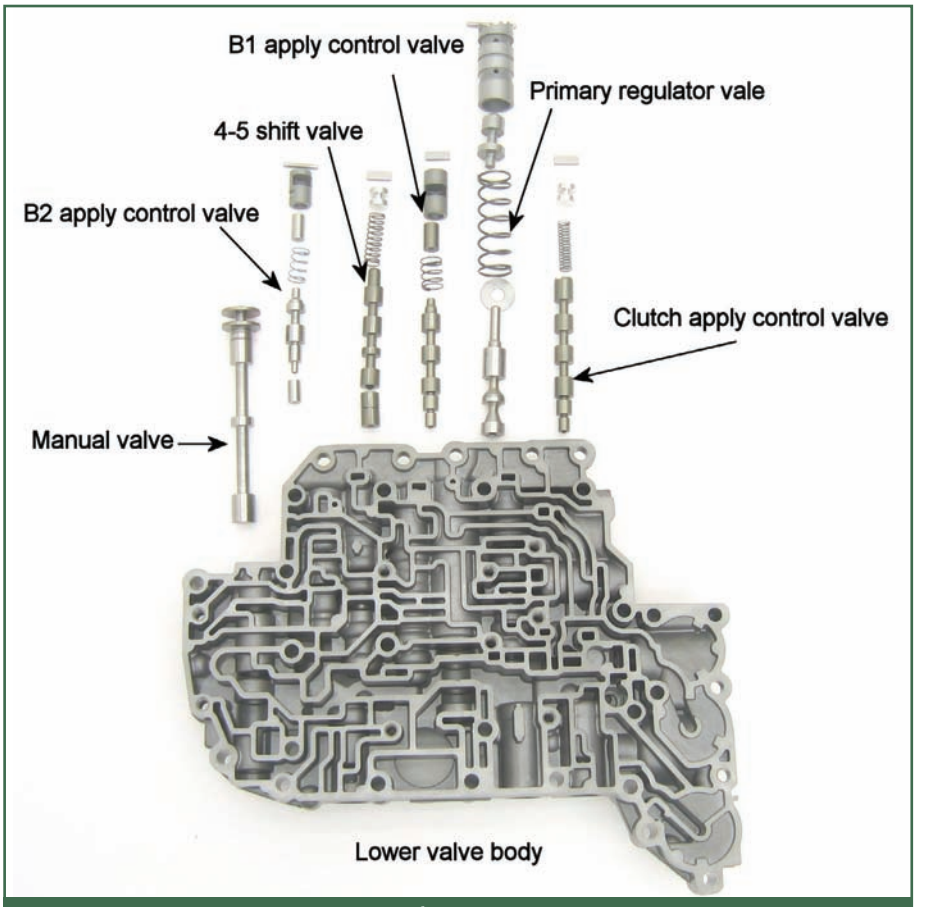


Figure 10

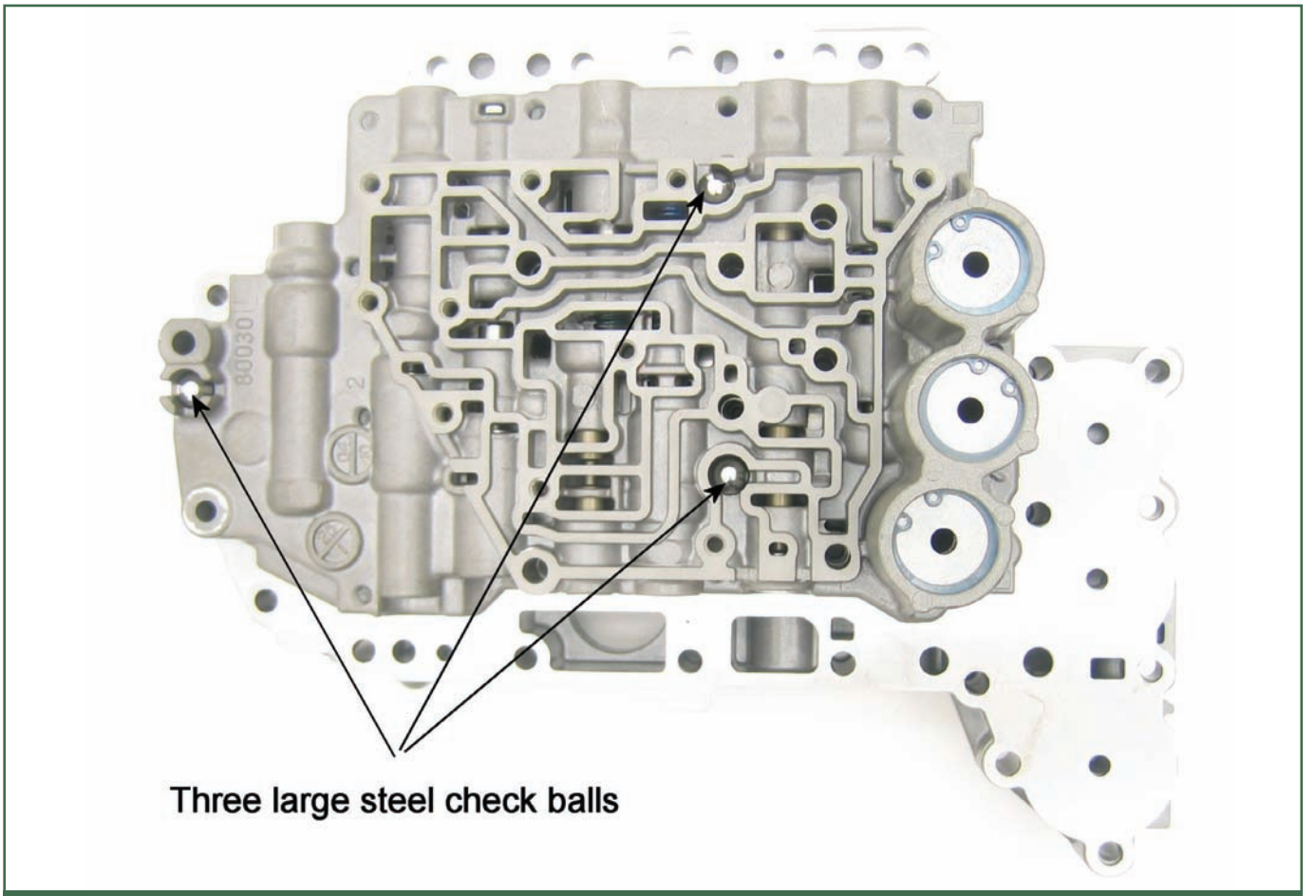


Figure 11

All of these checkballs are composite. During the rebuild, make sure that the checkballs seat on the valve body separator plate and aren't damaged or decomposed.

Figure 13 shows the check valve location — spring first then valve.

Figure 14 accumulator piston and spring identification and locations.

One very important thing to remember is that the U250E requires ATF WS:

- ATF WS is used to reduce the resistance of the ATF and improve the fuel economy by reducing its viscosity at normal operating temperatures. At higher fluid temperatures, the viscosity is the same as that of ATF Type T-IV, which ensures the durability of this unit.
- ATF WS and other types of ATF (ATF Type T-IV, D-II) aren't interchangeable. See the reduced viscosity in the chart (figure 15).

So with ATF WS you get improved fuel economy and durability and that's not only smart… it's *street smart!*

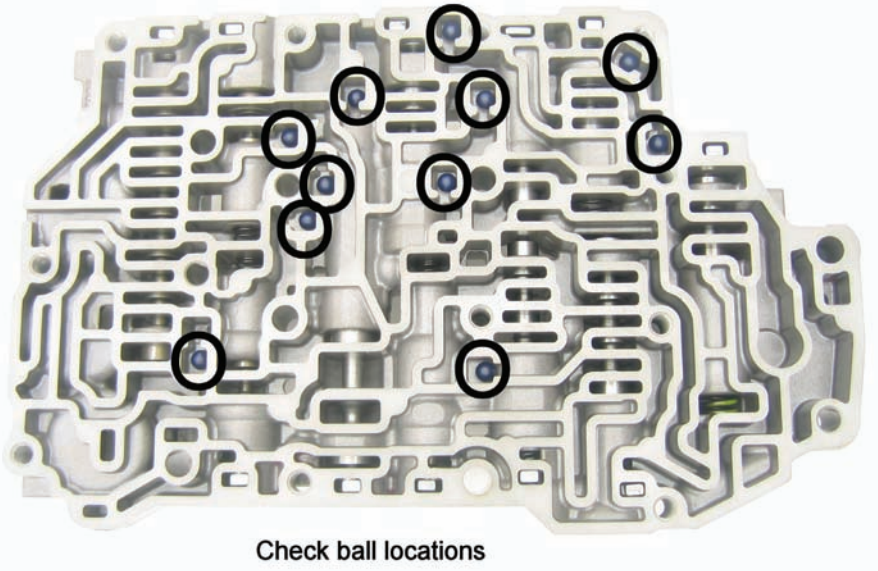


Figure 12

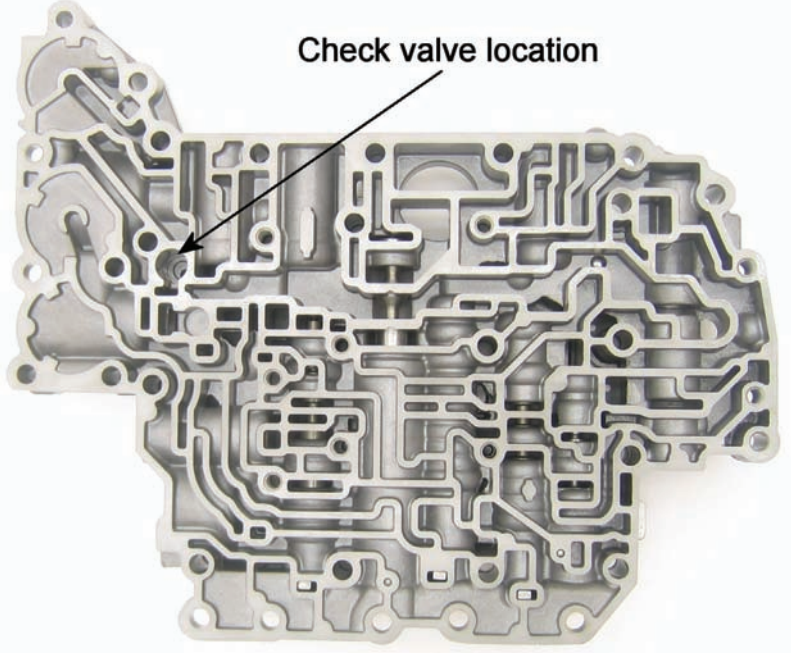


Figure 13

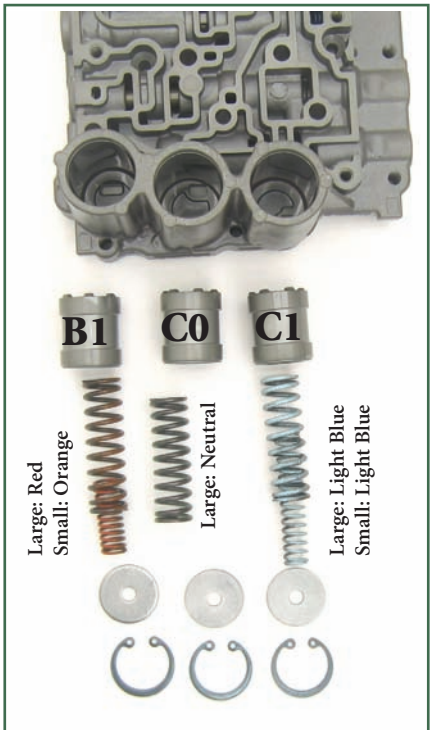


Figure 14

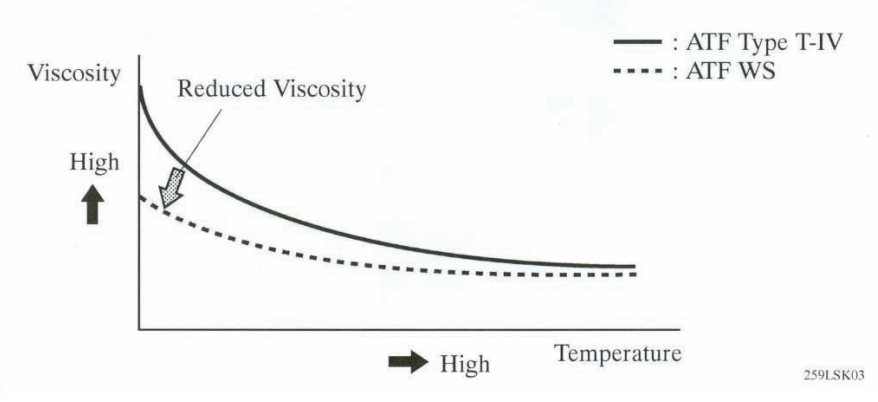


Figure 15

1978
was a good year.

Gas was 70 cents a gallon

A movie ticket cost $2

Mork & Mindy was a TV favorite

TransTec® kits were introduced

Mork and Mindy are long gone, along with $2.00 movie tickets and gas at 70 cents a gallon. But TransTec® transmission kits have grown to become the leading brand requested by transmission professionals. In fact, more TransTec® kits are installed than all other kits combined.

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Cutting Back on Advertising in *This Economy?*

by Thom Tschetter
Director of Marketing;
Certified Transmission

Cutting back on advertising when times get tough is tempting. But before you decide to cut your advertising, think responsibly before reacting emotionally. While I was preparing for this article, I got an inspiration from my car. I love my car, and some of my best insights come while I'm driving. Sometimes I feel like my car is talking to me.

When gas prices were at their peak, I began setting my dashboard computer to display "real-time" fuel economy. I noticed that I tend to drive less aggressively to keep the bigger MPG number on the display. On a hard acceleration from a stop until I reach cruising speed, the computer registers 10 MPG or less. But as I coast to a stop, it jumps as high as 90 MPG. Cruising along a fairly flat road it settles in at about 30 MPG. Overall, my average is about 26 MPG.

So what's my point? When you start advertising you have to pump more money in to get up to cruising speed. It doesn't take nearly as much to maintain a program once it's rolling. If you cut it off, it's like coasting to a stop because you have some momentum working in your favor. You'll get some immediate gratification through the temporary savings, but once the momentum's gone, you're back to zero. When you crank it up again, it's going to take about 4 to 6 months and a much larger investment than if you had simply maintained the program.

If at all possible, don't interrupt your advertising during bad economic times. Case studies consistently confirm that companies who pull their advertising and hunker down to ride out the economic downturn fall way behind their competition when things bounce back.

On the flipside, the same studies indicate companies that market aggressively in good times and bad leap past their competitors during the lean times and procure a sustainable, competitive edge going forward. It takes a high degree of faith to push forward, because the evidence of success isn't immediately available. That's because, while you're getting a bigger piece, the pie is smaller, and it only appears that you're still falling back. But when the pie starts growing again, you'll own a bigger slice of the bigger pie.

Think of it as buying market share at a discount. Your advertising dollars go further during slow times for two main reasons: First, because the competition is likely to cut back, there'll be fewer ads competing for attention, so your share of market awareness will increase. Second, because the media will also be sales-challenged, you'll be able to strike some great buys. In fact the deals are so good that you might want to lock in the lower rates for a year or more if the media reps agree to it.

It's important to focus on what you want to accomplish with your advertising in good times and bad. Here are some advertising tactics for advertising in a slow economy:

- To generate immediate sales, use more direct response advertising. This can include coupons and special offers that focus on added value or savings. But if you've already established a strong brand name, don't abandon image advertising… just reduce what you spend on it, and direct more toward direct response ads.
- To generate additional sales to current customers, run in-store specials that you can sell easily on cars already in the shop. You might want to add new services to your menu, and contact your existing customers to get them in for maintenance services.
- Generate new leads and prospects by cultivating your existing customer base for referrals and attacking the wholesale and fleet business with outside sales.
- Generate greater name awareness and familiarity using little or no money. If you aren't a member of the Chamber of Commerce or other local business and professional organizations, it's time to join. If you are a member, go to the meetings. It's amazing how many automotive shops belong to these organizations and don't go to the meetings. You'll most likely be the only automotive business there, and you'll attract the most attention.

Most importantly, be able to capitalize on the leads you get. Make sure you have a great attitude and sharpen your sales skills. You can't afford to lose leads or pass up sales opportunities when you get them.

So, when times are good you should advertise… when times are bad, you *must* advertise. But don't be reckless in your spending; make every dollar count to gain market share for a bountiful harvest, and most importantly, put on your best sales shoes.

Join the Network of Success!

The Certified Transmission Program is exclusively designed for progressive transmission shops striving to increase capacity, sales and profits. More than just another Reman unit; Certified transmissions are what we install in our own shops and are the preferred choice for hundreds of professional shops across the nation

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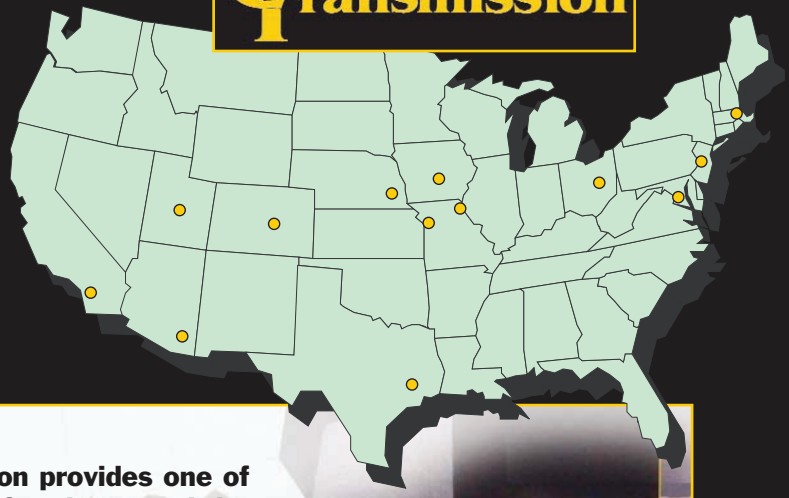

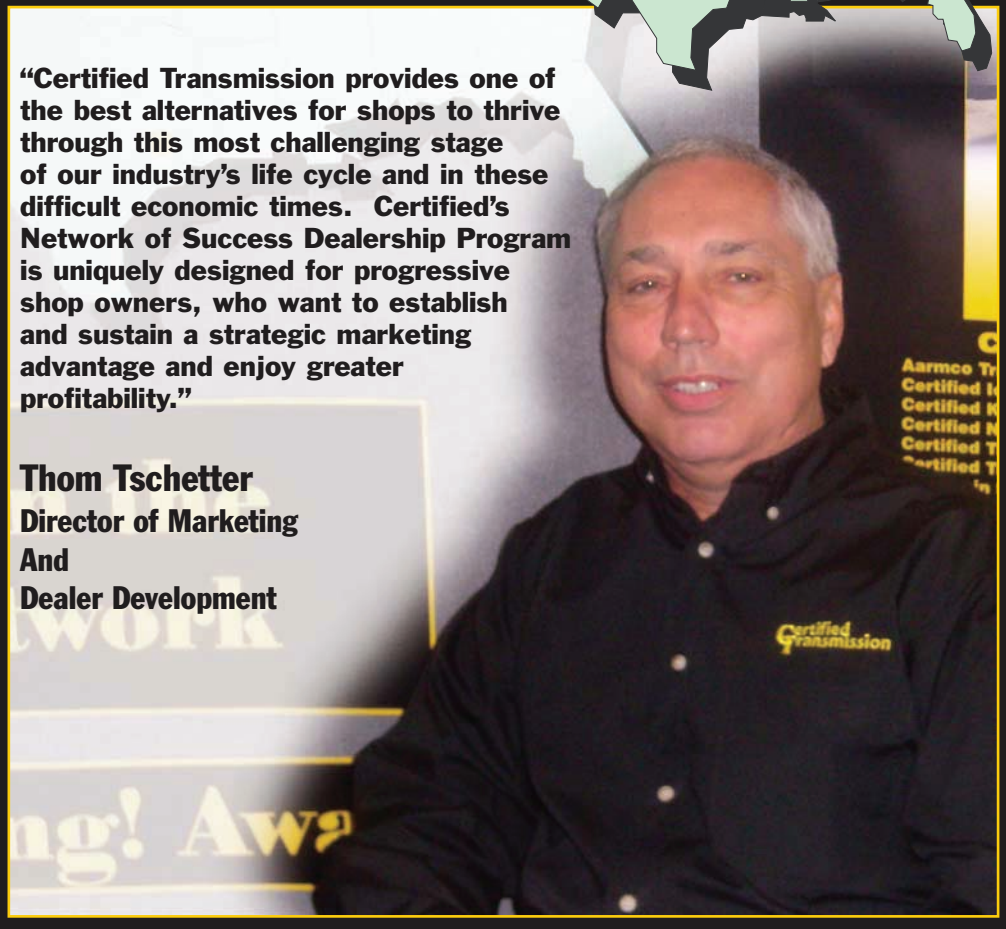

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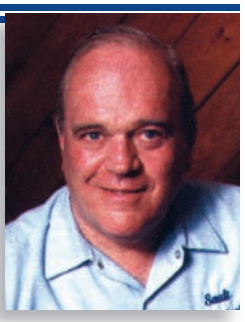
Your Shop's Operations Manual



by Paul Mathewson

Here's a scenario you can easily imagine: You own a successful transmission shop that's been humming along for years with you at the controls. Suddenly you're removed from those controls and unavailable. How does the shop get along now? In the short term everyone will probably rise to the occasion and wait for you to come back to solve the bigger problems. But what if you never come back? Then the long term survival of your business is a big question mark.

You may be called away because of a family tragedy or because you've contracted a debilitating illness. Maybe you decide to retire, or perhaps you've simply decided to expand and need someone else to take your place. Now that "someone else" needs to be privy to your system if he or she is to run the place successfully the way you do.

If your shop is a franchise, the answer is the *operations manual*. That's the franchisor's bible that dictates how every facet of your business is conducted. I know; I used to own a franchise. I bought a franchise precisely because I didn't know how to run a transmission shop. The franchisor's manual explains the kind of business and marketplace we're in. It also details the policies and procedures necessary to replicate the success their other franchisees experience.

Before you hand over the controls of your business, you must first hand over your experience.

If your shop isn't a franchise, your operations manual is probably in your head. All the whys and wherefores are locked away in your cranium. You alone know how and why you do things the way you do. The explanation for your successful business is imbedded in the hard drive of your brain. So how are you going to transfer this critical information?

One way might be to clone yourself and lock it away for your successor. A more practical way is to unlock the secrets from your mind by writing your own operations manual, just like the franchisor did for their franchisees. Yours will be better though, because the franchisor's manual is their safeguard for collecting franchise fees. Your operations manual protects *your* shop's revenue.

Here's the central problem: You've spent years refining everything related to the way you run your business, which is evident by the procedures you have in place. Those procedures are obvious, and were easy to put in place and teach others to follow. But those procedures need to have a supporting explanation that your successor will understand and believe in if they're to last.

Start by asking yourself some of these questions:

1. How did I settle on hours of operation for my shop when some of my competitors are open 7 days a week and late into the evening?
2. Why do I respond to offers for advertising and sponsorships the way I do? Which ones do I accept, which do I reject, and why?
3. When someone calls our shop for a quote, what do I hope to accomplish before we hang up?
4. What formula do I use to establish job pricing?
5. Why do we reject or solicit work from fleet accounts, car dealers, racecar clubs, or warranty companies?
6. What use do we make of remans in our shop and why?
7. Does my lead rebuilder expect me to pay for his training?

8. How do we dispose of waste products like ATF and cleaning materials?
9. How do we warrant our work? Is our warranty competitive?
10. Do we extend credit to any of our customers?

You're the filter through which these questions and dozens more are processed. You've been there through the trial-and-error period. Your successor needs to be privy to your wisdom before he or she becomes responsible for answering the same questions in the future.

There are very good reasons why you came to the conclusions you did regarding those sample issues, and hundreds more like them. But in reality, *you* are the reason. You made your decisions based on the current market situation, and the market is changing. Your successor isn't you and the market will certainly change in the future. But your successor needs a starting point. He or she needs to move forward from where you left off.

Years ago I had five transmission shops spread out over 1,100 miles. I flew my own airplane between them. The twin-engine aircraft had an operating manual that I understood. It explained why and how everything worked. It told me what to look for in the walk-around prior to takeoff. It explained run-up procedures, fuel management, weight and balance calculations, takeoff and landing procedures, engine monitoring, and the like. I knew this aircraft inside and out because the operating manual was complete.

The aircraft operations manual was the starting point for me as I learned to pilot this great airplane. There was still a lot for me to learn from real-life flying experiences. But before I took the controls I needed to be briefed by the accumulated wisdom of the folks who created the operations manual. Understand this: Before you hand over the controls of your business, you must first hand over your experience. That's what your operations manual does.

So how do you create your shop's operations manual?

Three years ago I went into seclusion for a few weekends to write an operations manual for our shop. It served us well for daily operations and isolated us from a lot of potential litigations. Now the new owners of my shops are on their own and don't need me to be there directing them.

My experience at writing our operations manual will help you to write yours. The biggest task is to assemble the various topics and give them an order (like the table of contents listed at the front of any book). Over the next few months, I'm going to share my format with you and help you get started writing your own operations manual. I promise to make it easy for you.

Watch for the next edition of *GEARS* and the template you need to get started.

Paul Mathewson is a retired transmission shop owner with over 25 years of experience operating transmission repair shops. At one point he ran five shops, which he commuted between on his twin-engine private plane. Paul is quick to credit much of his success to the support he received as an ATRA Member, and is eager to help other shops benefit from his experience.

What's Inside the AS68RC (A465) Transmission, Part 3

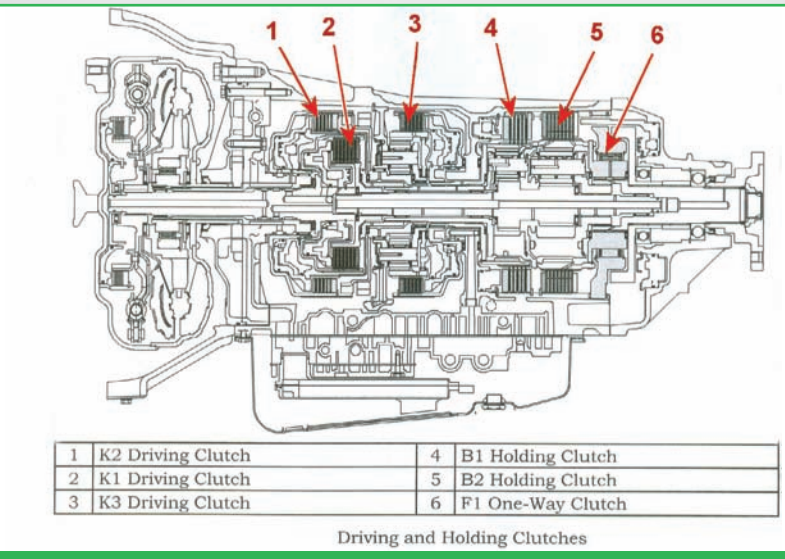
by David Skora

In this issue we'll look inside the AS68RC to see what makes it work, and what it takes to get it working again if it breaks.

When someone asks you about overhauling a 6-speed automatic truck transmission, do your knees start to shake? If it's one of the new Dodge AS68RC or NPR A465 models, you shouldn't be worried at all. These units only have 5 clutch packs, 1 sprag, and 3 planetary assemblies, along with a typical pump, valve body, etc. This does, however, create a complete unit that weights about 400 pounds! So what we're going to do is assume someone has dropped one of these units on your doorstep… in 4 or 5 boxes!

With everything cleaned and inspected, mount the case in a strong fixture with the bellhousing facing down. Take a look at the internal view (figure 1) to become familiar with the arrangement of the unit. Each clutch and mechanical element can go in only one place. Also take stock of the various mounting bolts. My unit had several corroded and broken bolts, and some of the bolt heads were rounded off. If you run into a similar situation, plan on replacing any broken or damaged hardware.

NOTE: If you're installing new frictions, soak them in AS68RC fluid for at least 1 hour before installing them.



1	K2 Driving Clutch	4	B1 Holding Clutch
2	K1 Driving Clutch	5	B2 Holding Clutch
3	K3 Driving Clutch	6	F1 One-Way Clutch

Driving and Holding Clutches

Figure 1

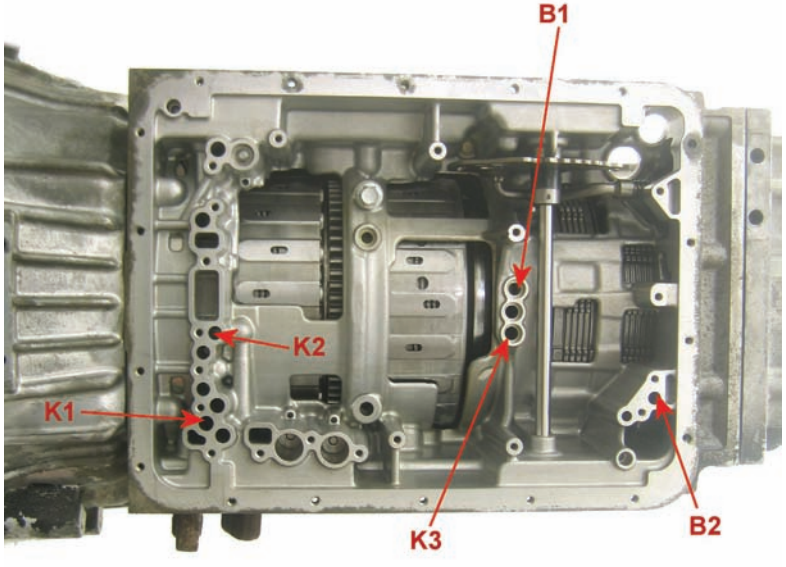


Figure 2

1. To adjust the B2 clutch assembly (#5, figure 1), install it in the rear of the case.

2. Install the extension housing complete with the B2 apply piston.

3. Turn the case over.

4. The factory recommends using a dial indicator mounted to the front half of the case, so the gauge rod contacts the front of the B2 backing plate. You may need an extension rod for your dial indicator.

SuperFlow Buyers Guide for Quality Transmission Rebuilding Equipment

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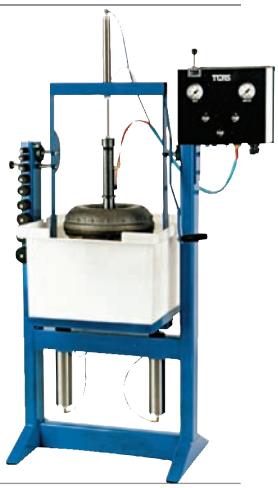

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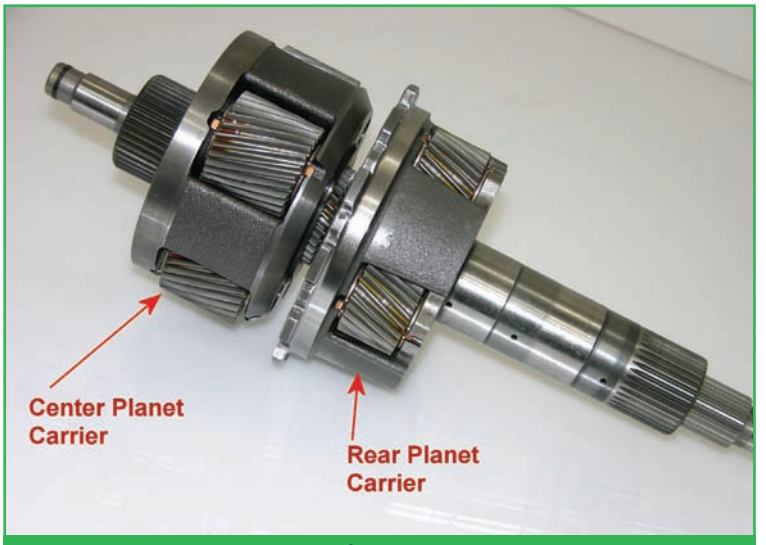

Figure 3

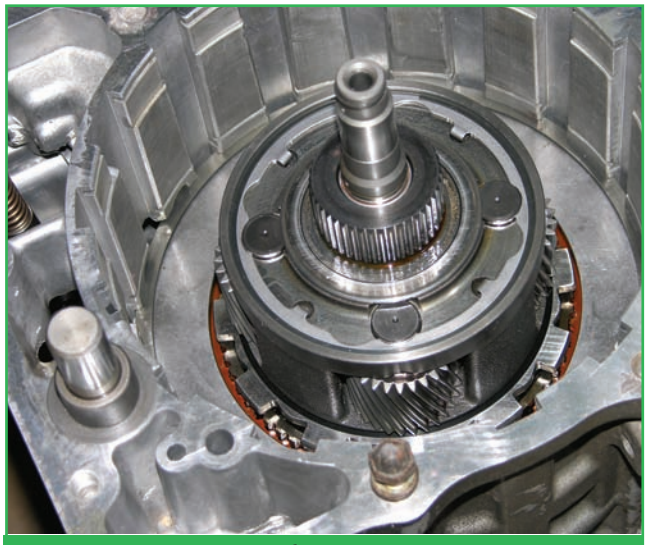

Figure 4

Look at the center support of the case; you'll see a small hole there for this procedure.

5. Apply 58-78 PSI air pressure to compress the clutch pack and make sure the travel is 0.072" – 0.090" (figure 2). That takes care of the B2 clutch clearance.

6. Turn the case back over.

7. Remove the extension housing and the B2 clutch assembly and set them aside.

8. To install the B1 clutch piston and return spring retainer (#4, figure 1), you can adapt a sun shell from an RE4R01A transmission to compress the springs and install the snap ring.

9. Install the B1 clutch assembly and secure it in the case with a snap ring.

10. Mount the dial indicator to a secure part of the case and locate the gauge rod on top of the B1 backing plate.

11. Apply 58-78 PSI air pressure to compress the clutches and measure

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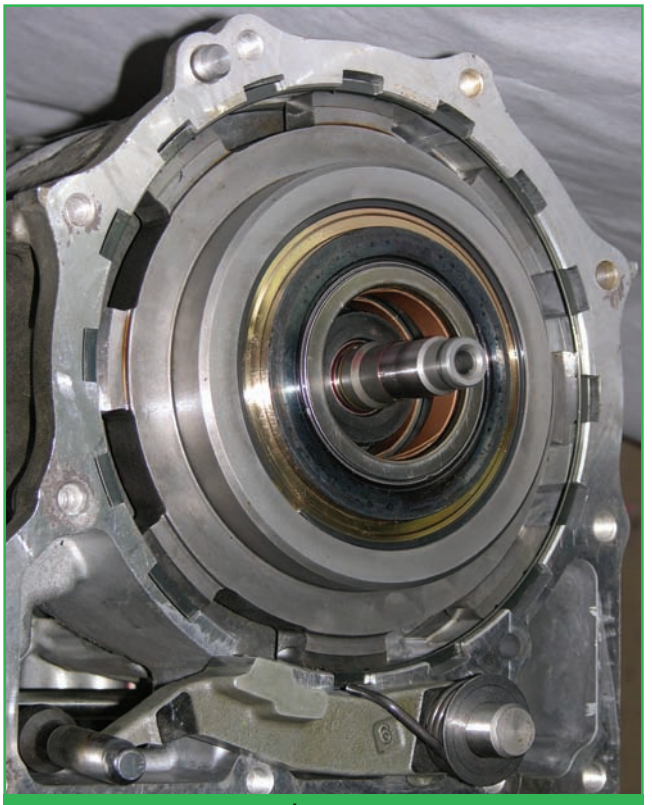

Figure 5

the B1 clutch travel. Make sure the travel is between 0.061" – 0.071" (figure 2). That's all there is to adjust the B1 clutch clearance.

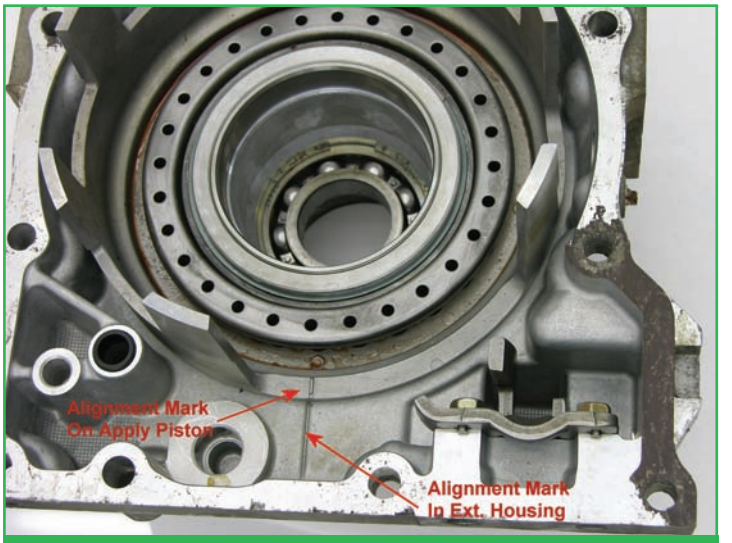

Figure 6

12. Remove the dial indicator.

13. Install both rear planetary assemblies with intermediate and rear shafts (figures 3 and 4).

14. Reinstall the snap ring, B2 backing plate and B2 clutch assembly. You won't need to check the clearance again after having done so in step 5.

15. Make sure the L/R sprag rotates clockwise when viewed from the front. Notice that the L/R sprag support has 8 lugs. Locate the two opposing lugs so they point straight up and down (figure 5). Figure 5 also shows the correct parking pawl, spring and washer setup. Don't forget to position the

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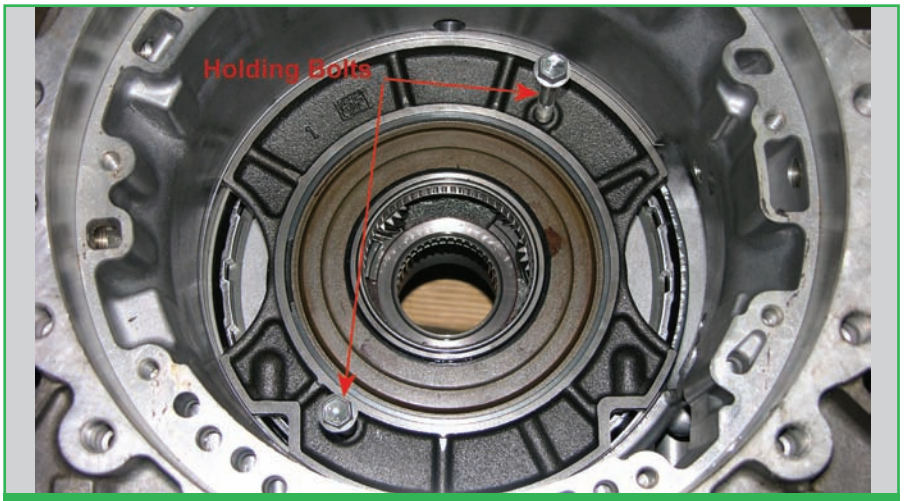

Figure 7

control rod *under* the park pawl.

NOTE: The L/R sprag is held in the case by the two thinner snap rings.

There's a vertical line inside the rear extension housing. Make sure you match this with the line on the B1 apply piston. If you don't align these marks, the apply plate won't slide between the lugs on the L/R sprag, so it won't compress the B2 clutches. And if you don't line up the L/R sprag support in the case, the apply piston either won't apply the clutches, or might interfere with the parking pawl and the output speed sensor operation (figure 6).

16. Install the rear extension housing. Make sure the endplay is 0.019" – 0.035".

That's it for the rear half of the unit. Assembling the front is just as easy:

17. Turn the case around so the bell-housing faces up.

18. Assemble the K3 drum with apply piston and clutch assembly (#3) at the front of the center support (figure 1).

CAUTION: I know you're tempted to use feeler gauges to check the clutch clearances. Don't. The reason for using a dial indicator to check the clutch travel is because the air pressure will compress the clutch stack evenly to the apply piston.

19. Install the front planet ring into the K3 clutch.

20. Mount the dial indicator to a secure part of the case with the gauge rod touching the K3 backing plate.

21. Apply 58-72 PSI air pressure to compress the K3 clutch stack. Verify the clutch travel is 0.063" – 0.071".

22. Remove the dial indicator.

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The carrier support mounting bolt holes must align with the case. If they aren't aligned, you may strip the bolts or support.

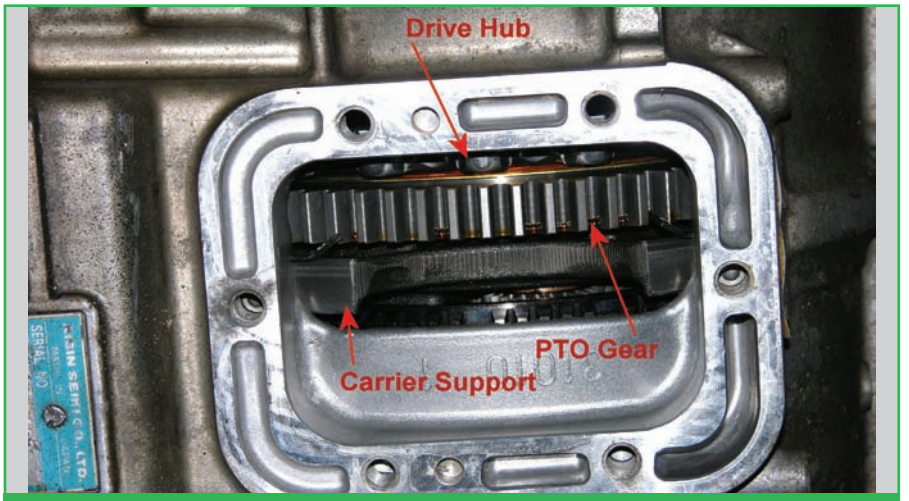


Figure 8

23. Line up the planetary carrier support so the two threaded mounting holes face the bottom.

24. The support is a very tight fit in the case. Apply a lightweight lubricant to the case and support to make it easier to slide into place.

25. Use two long bolts to align the planetary carrier with the threaded bolt holes, and slide the support into the case.

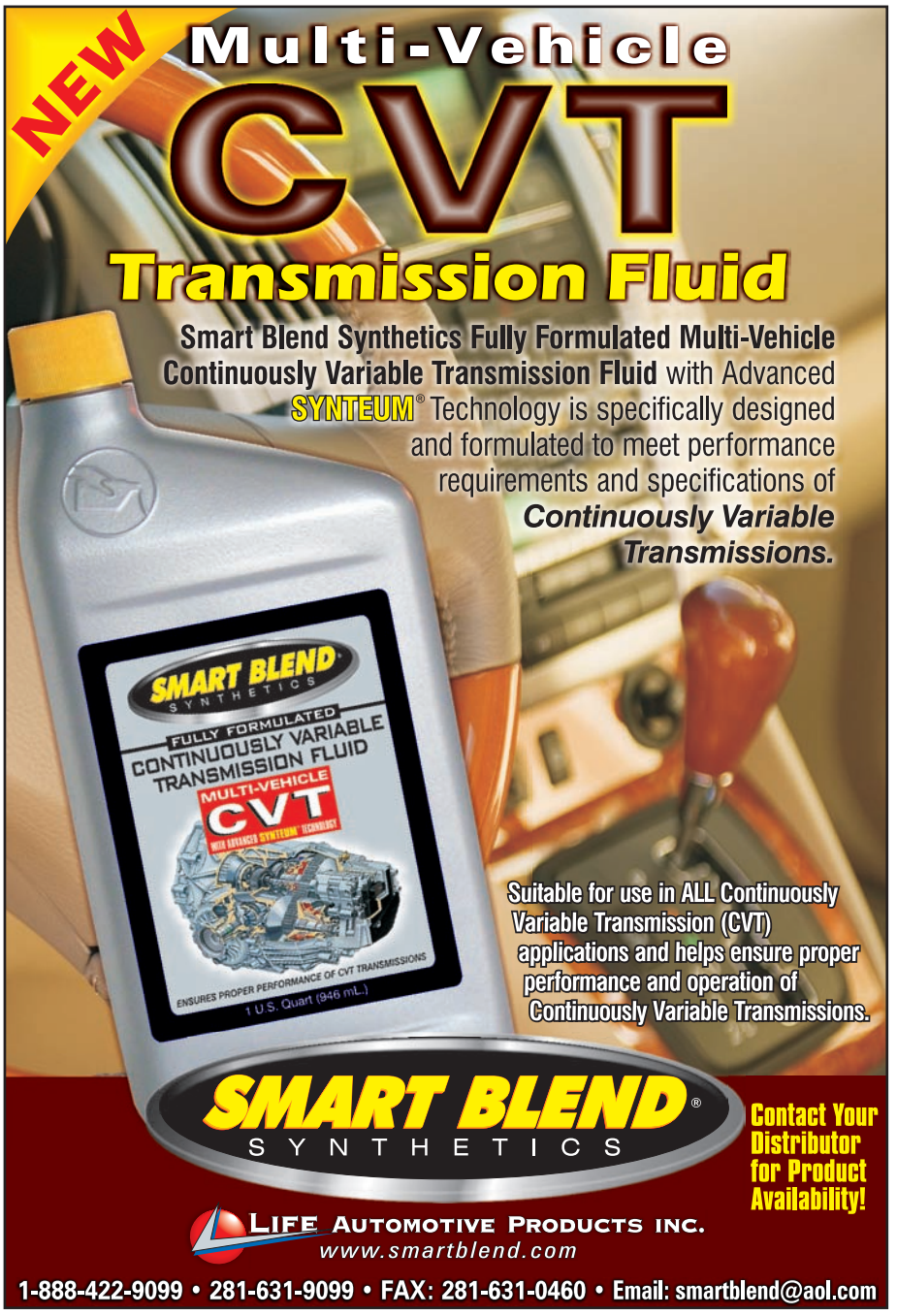
Holding the planetary carrier forces both sets of pinions to turn in the same direction. This allows this unit to keep the planet in reduction or direct and operate like a Lepelltier geartrain.

CAUTION: The carrier support mounting bolt holes must align with the case. If they aren't aligned, you may strip the bolts or support. To make installation easier, freeze the carrier support or heat the case.

26. Install the carrier support bolts and tighten them to 28 lb-ft.

27. Install the large snap ring with the open ends facing the PTO opening (figures 7 and 8).

28. Install the drive hub with PTO gear. Figure 8 shows how the planet carrier support, PTO gear and drive hub should look from the PTO opening.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Check the K1 clutch travel similar to way you did the K3 clutch; it should be 0.059" – 0.069"

The oil pump is cast iron and should be very durable. The stator support includes the pressure regulator and TCC control valves.

29. Disassemble the pump. Remove and inspect all components for wear or damage.

30. Assemble the K2 clutch.

31. Place the K2 clutch on top of the pump assembly.

32. Apply 58-78 PSI air pressure to compress the clutch stack, and use a dial indicator to verify the clutch travel is 0.061" –0.071" (figure 9).

33. Check the K1 clutch travel similar to way you did the K3 clutch; it should be 0.059" – 0.069" (figures 9 and 10).

34. Grease the K1 drive hub and align it with the K1 clutch assembly.

35. Carefully spline the K1 clutch assembly drive hub with the intermediate shaft in the case (figure 10).

36. Spline the K2 clutch assembly into the drive shells.

37. Install the pump assembly. Make sure the front input shaft endplay is 0.019" – 0.035".

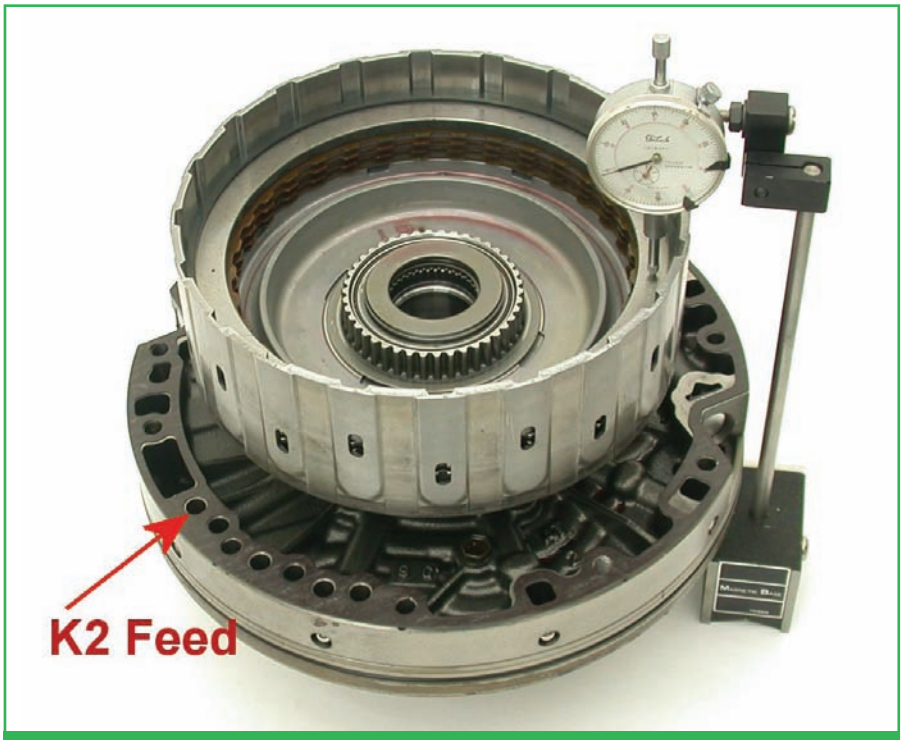

Figure 9

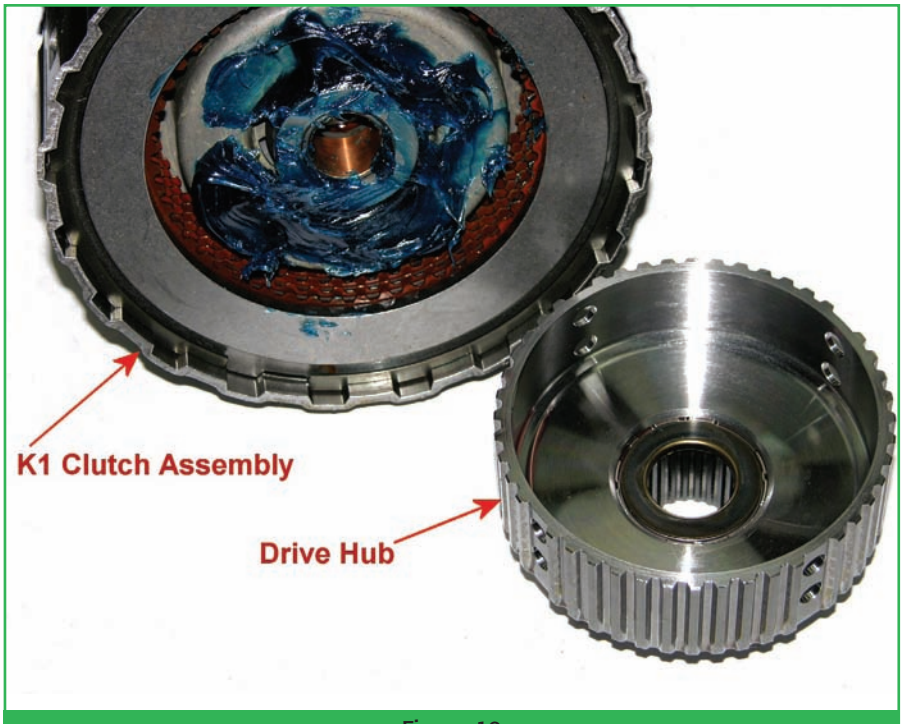

Figure 10

To complete the unit, you should have the valve body assembly ready to go, or, if it's apart, take a look at part 2 of this series in the November 2008 issue of *GEARS* to see how to assemble and install the valve body, including how to connect the wiring.

Your boxes should be empty now except for 2 speed sensors, the inhibitor switch, the filter and the pan.

And that's all there is to it; the unit is back together and ready to be installed. Which proves once again that rebuilders *can* think outside the box(es)… and get paid for doing it.

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Tips to Prevent Strains and Sprains

by Judy Kerry
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Strains and sprains account for a majority of workplace injuries and lost work time. The injuries are often caused by lifting, pushing or overreaching and usually affect the back, shoulders, and arms. Although it only takes a moment to cause one of these injuries, it can take many painful days or months to heal. Preventing strain and sprain injuries is a lot easier than correcting them.

Reaching

Strain increases in proportion to the distance of the work from your body. There's less strain on your body if the work is positioned directly in front of you and between your shoulders and waist, with a waist-high level being the most neutral and comfortable. So, try to work with your arms below your shoulder level and stay as close to the work area as possible. You may need to raise or lower yourself with a stool or ladder for better positioning. When reaching down, 'build a bridge' by putting one hand on a nearby surface to support your back.

Bending

Strains and sprains can occur from activities performed in awkward positions or when bending over and relying on your back for support rather than your leg muscles. When performing activities below your waist, bend your knees and squat down to position yourself closer to the work. If the task requires you to maintain a squatting position for a while, alternate kneeling down on one knee to transfer the load off your legs and back. Use a kneeling pad to reduce trauma to your knee.

Pushing or Pulling

Sometimes equipment can put more strain on your body if you push or pull it incorrectly. If given the choice, push rather than pull a load. But, in both cases, get as close to the load as possible. When pushing a load, use both hands and arms keeping them in close to your body; keep your back straight and lean into the load; then, use your whole body weight and leg muscles to walk the load as you push. If pulling a load, use both hands and arms; keep your back straight and lean away from the load; and again, use your whole body weight and leg muscles to walk the load as you pull.

Your body works best when it's used as it was designed. When you force your body to do things beyond its capability, you risk a strain or sprain injury. How can you prevent these injuries? The obvious thing is to keep yourself in good physical condition and work within your limits.

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The Password is "ATRA"

The television game show *Password* was recently resurrected and given a new look. For those of you who aren't familiar with the show, one contestant is given a word; it's his job to get his partner to guess that word by offering clues. For example, if the password was "water," the contestant might give the clues "wet," "river," or "ocean."

For years, if the password had been "ATRA," the first clue most contestants would have offered would have been "hotline." No great surprise there: ATRA was basically founded as a technical cooperative. And for the first few decades of its existence, technical support was its primary function.

Maybe twenty years ago, ATRA's focus began to change, to offer more business support. A larger percentage of its resources went to management training and services. But the bulk of its operation was still to provide technical support for transmission repair shops.

Then, maybe five years ago, we really kicked our management support into high gear. We began to commission studies to learn what works, and started tailoring our training programs to provide targeted support for the changes taking place in the industry… and in the world.

One thing that no one bothered to acknowledge was that, at its core, ATRA was really a *business* support service. When transmission shops needed technical support, that's what we provided. When the industry began to change, we changed with it… not simply to react to the changes taking place in the industry, but because, at our most basic level, we were a business service. So it was our job to provide business support for the transmission repair industry… whatever that meant at the time.

Today's transmission shops require a very different type of support than those of a half-century ago. They need consumer research, management and sales training… and of course, technical support. And once again, ATRA is here to meet those needs.

What's important to remember is that ATRA hasn't really changed. What has changed is how we *think* of ourselves. We've come to recognize that, at a fundamental level, ATRA is a business support association. We're in the business of providing ATRA Members with the support they need to meet the demands they face every day… whatever those demands may be.

Probably the best description of how ATRA has changed its view comes from CEO Dennis Madden: "Today's ATRA is your business partner for a changing industry. We're taking the time to study the behaviors of consumers to learn how they choose a transmission shop. And we're examining the most successful shops — and the least successful — to identify what works… and what doesn't. Our job is to help you make the right choices in your business; choices that'll help bring more customers into your shop, and put more money in your pocket."

Learning What Works

One of the most important things we had to address was the difference between what we think versus what really is. The fact is, people in the automotive repair industry have had a lot of preconceived notions about our business… notions about what customers think… about what they're looking for… and about how to bring them in the door. Some of those notions turned out to be right on target; many others were way off base.

So our first goal in recent years has been to clarify what is. We began with a series of surveys, to find out how today's shops were operating and how they were doing. Much of what we discovered was obvious, and only served to reinforce our opinions of the industry. But several results completely contradicted what most people considered to be gospel.

Such as advertising. We've always considered a Yellow Pages ad to be an absolute necessity for operating a transmission repair shop. The bigger the ad, the better, and the more books you were in, the more work you'd pick up.

Imagine our surprise to discover that some of the most successful repair shops had a minimal Yellow Pages ad or even no Yellow Pages presence at all. And that there's no correlation between the size of the ad and the success of the shop. We'd always heard that size didn't matter, but we never really believed it before!

Even the number of books didn't seem to make any real difference; a single ad in the most popular phone book was just as effective as multiple ads in all of the books that cover a region.

We also learned the most valuable advertising wasn't in a phone book or street sign; it was about becoming involved with the local community. Turns out that sponsoring a local team or taking part in community activities carries a lot more clout than a giant billboard or an expensive web site. And in most cases, those community programs are a lot less expensive than any other form of advertising; a win-win if ever there was one.

No doubt about it: We learned a lot from those shop surveys. But they only answered part of the question. So to learn the rest, we went right to the source, to get the consumers' take on the transmission repair industry. We sponsored a number of consumer focus groups and internet studies, to find out what goes on in consumers' minds when they're faced with transmission problems.

The results of these studies have been detailed in a complete report — the *2008 Consumer Marketing Study* — available for download from the ATRA web site. This study offers no specific conclusions; it leaves that to the reader. What it provides is a clear insight into the industry and the mind of today's consumer.

Management Training Changes

How has this level of research affected the management training for the transmission repair industry? It should come as no surprise that ATRA's programs have been completely

redesigned and coordinated to address the conditions we've collected from our studies.

Probably the most noticeable change to ATRA's management programs is at the annual Powertrain Expo. Instead of a series of unrelated seminars, the new program has become a cohesive, 4-day program, designed to offer shop owners and managers a thorough understanding of the issues they face, and provide a strategy for addressing them. No great surprise there: You'd expect ATRA's program to reflect its research.

What was more unexpected is how many other programs have been altered, based on the data we've collected. A substantial number of the management training programs being offered to the transmission repair industry now include and address the latest data collected from the ATRA study. And at least one of the major computer-based programs also reflects this new-found data, taken right from ATRA's research.

Technical Support Is Still Important

As we examine the importance of understanding consumer motivation and business strategies, it's easy to forget how important ATRA's technical support is to the industry. Today's automatic transmissions are no longer the simple 3-speed hydraulic units many of us started with just a quarter century ago. Today's transmissions have four… five… six speeds and more. They have lockup torque converters, multiple operating strategies, and are controlled by a computer system that's integrated into the entire vehicle. So technical support is no longer just a convenience: It's become a necessity.

And since the need is there, ATRA is there, too, providing technical support that's second to none. Our HotLine includes some of the finest technical minds in the industry, waiting to help you work through those intricate or complicated diagnoses and repairs. The ATRA HotLine is your lifeline for emergency technical solutions; it's like having the experience of 10,000 technicians always just a phone call away.

Need to find a schematic or a checkball application? Our technical web site offers more articles and information than any other industry resource. Every *GEARS* article and technical bulletin created over the last 10 years or more has been painstakingly cataloged and preserved electronically. And each one can be recovered in seconds, through keywords, transmission application, or subject.

Emergency technical support is a terrific resource, but not everything needs to be an emergency. The best way to prevent those emergencies is to stay up to date with high quality technical training. And no one provides better, more up-to-date technical training than ATRA's Technical Department. Our HotLine technicians take the calls they receive to create real world training that addresses the problems you're seeing today… and those that'll be making their way into your bays tomorrow.

Want to complete your shop's technical library? Pick up some of the latest self-study tech training? Take advantage of ATRA's exclusive point-of-sale support? No one can offer a wider variety of materials than the ATRA BookStore. And as an ATRA Member, you can save big by taking advantage of our exclusive, Member-only discounts on everything we offer.

What, you're not an ATRA Member? Well, there's never been a better time to join. Stop by the ATRA web site, at www.atra.com, or call the ATRA Membership department at 1-805-604-2000 and let them know you want ATRA to be your new business partner for a changing industry.

Once upon a time the name ATRA was synonymous with the word "hotline." But in reality, ATRA has always been about serving business… *your* business. So, when you hear the clues "partner," or "business support," you can be sure that the password is "ATRA."

To learn more about ATRA or the benefits of being an ATRA Member, stop by ATRA's web site at www.atra.com/benefits, or call the ATRA Membership Department at 805-604-2000.

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Why Attend ATRA's Management Seminars?

by Martin Brooks
Aceomatic Transmission,
New Zealand

As an international attendee at ATRA's Expo in Las Vegas, I'm often asked, "Why are you attending the management seminars?" by other international attendees. "It doesn't really apply to our market," theyt say, "and most of it is just American BS."

This reaction always puzzles me. I've always thought that people were people and a customer was a customer, wherever you happen to be. So, as an international Expo attendee who's experienced the management track for several years now, I'd like share what I've learned over the years.

Like most shop owners, I started out as a technician, and worked my way up until I eventually bought the shop where I was working. At this stage the shop employed four people, including me. I was the office manager, the shop diagnostician, and I even tried to work in some time rebuilding. As you can imagine, I was working long hours and most weekends. The shop had become my whole life; I'm sure that many of you are familiar with that feeling.

Then, in 1990, I decided to attend my very first Expo in Las Vegas. I was going to combine business with pleasure, taking a bit of well-earned vacation at the same time. This meant I was going to be away from my shop for over two weeks. No problem: I could set up some systems to take care of things, hire a temporary worker to do the paperwork while I was away, and could always catch up when I arrived home. It took two weeks to get ready to go and four more to clean up the mess when we got home. Obviously there was something wrong with the processes we had in place.

So I started to read some management information in industry publications and I began to realize that I had it wrong. Instead of concentrating on simply getting the job done, I needed to spend more time on the *business* end of my business. Of course, back then, shop management information was fairly sparse: no Internet, no emails and very few international contacts.

But things were starting to change: the Internet was growing into a useful resource, email groups started to appear, and technical information was becoming more readily available. And finally some management talk started making the rounds.

Over the next few years I attended Expo about every second year. I mainly concentrated on the technical seminars, but I made it a point to take in one or two management classes as well. The industry was changing rapidly, and so was our business: We expanded to a second site and I was now employing

I come back from Expo with a new enthusiasm for the business. Talking to other, successful shop owners and managers provides a wealth of information to take back and put to work.

around 12 people. Listening to the various management speakers during this time was helpful, but it wasn't until I heard Bob Cooper speak that I truly made the leap from thinking like a technician to realizing that if I was really going to make it, I needed to focus on managing my business and learn as much as I could about effective business practices.

ATRA's dedicated management stream has made a huge difference in my outlook on the industry… and my business. Suddenly I can listen to a wide range of speakers, all in one place, and all with their own little tips and tricks to "get 'em in the door." But what I learn doesn't just come from the speakers: During the seminars, attendees ask questions or make comments that get the wheels turning in my head. By the end of the program I have a dozen new ideas to take back and try in my own shop.

I come back from Expo with a new enthusiasm for the business. Talking to other, successful shop owners and managers provides a wealth of information to take back and put to work. Obviously some aspects are different in different countries and not everything that works in the United States will work in New Zealand. But then again, not everything that works in Nebraska will work in New York or California. The trick is to listen to everything, and then adjust the ideas to work for you.

So what have I brought back from Expo? To begin with, I have a much clearer concept of how to run a successful shop. Listening to some of the speakers and other shop owners I learned better ways to get the most from the people I work with. Involving the staff in the decision-making process continues to be a useful strategy in keeping them energized and interested.

We've modernized and tidied our customer waiting room and office areas. We're implementing a major software upgrade to allow us to measure our performance and find out where our customers are coming from. I've implemented staff training sessions on both management and technical issues, which I'm planning to increase over the next 12 months. And we've set up a small training room and are running seminars on transmission diagnosis for general shops and dealers. This has proved to be a useful way to reach out to the people who can send us customers.

There's no way I can use all of the suggestions and ideas that I hear. In some cases something what works in the US would fall flat in New Zealand, due to cultural differences. But there's an awful lot that can be used or modified; it's just a matter of paying attention to what other are doing or saying. The next few years are likely to be a challenge for us all, and we need all the help we can get to weather the tough times ahead.

So, if you want to get some fresh new ideas for bringing more work into your shop, consider attending the management track at next year's Expo. You just may be surprised at the difference that it can make to your outlook on both the business and life in general. The skills I've taken away from these events have given me the tools to improve both my business and myself. I wouldn't miss it for the world.

by Lance Wiggins

JUST DO IT

Happy New Year! Wow, time is flying by, and hopefully we're all having fun! 'Tis the season: a new year with a new goal. Well, not really a new goal. In fact, our goals haven't changed since our beginnings over 50 years ago: A handshake, an honest word and good old fashion hard work… since 1954, it's what ATRA has been all about.

Our goal began with a handshake between two shop owners, so very many years ago. Who'd have thought, 50+ years later, we'd still be here, leading the industry and stronger than any chain in the world. Today ATRA remains your business partner in an ever-changing industry.

Of course, change is never easy. It's hard to hear about, it's hard to talk about, and it's extremely hard to do. But if you've been in the business for at least, oh, say ten minutes or so, you've probably already dealt with some level of change, so you might think we'd all be used to it by now. Yet somehow it always seems to be a big deal.

There are probably a hundred reasons why change is always so difficult to deal with. Old habits, they say, die hard. But die they must, to make way for new ones. And the fact is, change happens whether you're on board or not. So, as a friend of mine once said: *NIKE,* which was her clever way of saying, "just do it!"

But as the industry changes, so do we. We're here to make your business easier… more profitable… better in every aspect of the word.

We're working to make your business better through effective technical support, an internationally-recognized warranty, management training, networking, consumer support, industry analysis, charting demographics, and a clear and precise projection of what the industry is doing and where it's going. And all of this for about what you'd spend for a cup of coffee.

Our new web site has more information on it than any other industry site. It provides ATRA Members with instant access to 17 years and over 3500 pages of seminar books, 1230+ bulletins, countless technical training manuals, factory training information, *GEARS Magazine* articles from 1996 to the most recent issue, technical videos, and much more.

Change. It's how we keep up with the industry. And it's what we do for you, to keep you on the cutting edge of our ever-changing world. Because we're your business partner for a changing industry… you have our word on that!

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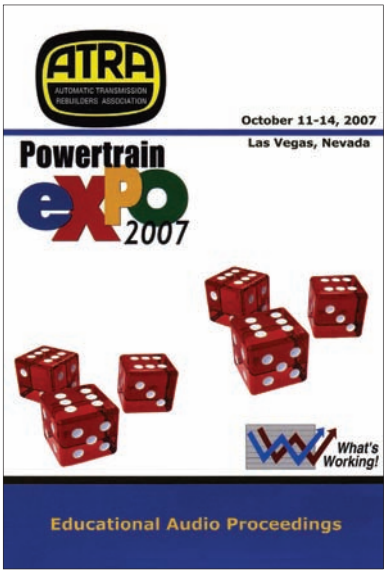

We have managed to fit ALL of our technical and management information from ATRA's 2007 Expo binders, over 1300 pages, onto one CD! Pick up this 2 CD set right now for only $100, a savings of over $300!

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Quick Takes

by ATRA Technical Department

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Welcome to *Quick Takes!* This is a simple, easy-to-use information resource covering the newest transmissions to hit the streets.

In *Quick Takes* you'll find all the basics: The transmission designation, what cars it appears in, and the most general explanation of its configuration. You'll find general specs, service requirements, and maintenance suggestions.

Think about the things you need to know when a new transmission shows up at your door. How many speeds? Any special shift characteristics? When does the factory recommend service? What type of fluid? And other reference information.

Looking for in-depth coverage and explanations of the theory for today's transmissions? You won't find that in *Quick Takes:* This is just the down-and-dirty, basic intro and info for the latest units coming down the pike.

Of course we'll still be providing those in-depth descriptions, diagnostic procedures and repair tips that you've come to expect from *GEARS*. They'll usually come later, once the unit gets closer to the end of its warranty coverage. And they'll come elsewhere in the magazine. *Quick Takes* is exclusively for those unit introductions that are so critical when a new unit makes its way into your bays.

So have a look and pay attention: *Quick Takes* is the crystal ball for your business… you can bet that what you see here will provide your first glimpse into your future.

CHRYSLER 62TE

The 62TE is the new generation of FWD/AWD transaxles in production for Dodge and Chrysler, including JS Sebring, Sebring Convertible, Avenger with the 3.5L V6, and CS Pacifica with the 4.0L V6.

The idea was to take the proven-reliable 41TE 4-speed and split the transfer/pinion drive with an underdrive/direct clutch to split the ratio to the final drive. This concept has been around for many years but has been reintroduced in the 2007 model year.

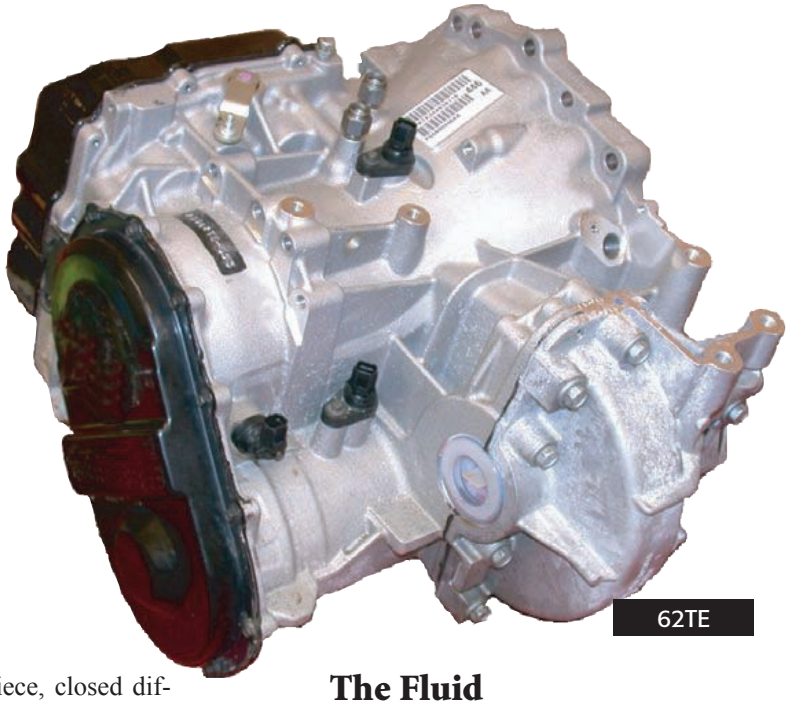
Although this is classified as a 6-speed FWD transaxle, there are 7 forward speeds with the addition of a 4th gear prime ratio used during a 6-4 kickdown. This prevents a double swap of components, allowing for a smooth kickdown.

The Guts

The planetary geartrain for the 62TE transaxle provides six forward gear ratios, including two 4th gear ratios, and one reverse gear ratio.

- Underdrive (UD) Compounder Assembly
  1. Low Clutch (LC)
  2. Direct Clutch (DC)
  3. Overrunning Clutch (ORC)
  4. Planetary gear set

- Fore-Mounted Valve Body/Solenoid/Pressure Switch Assembly
  1. DC solenoid
  2. LC solenoid
  3. DC pressure switch
  4. LC pressure switch
  5. Torque Converter Clutch (TCC) and pressure control Solenoids
  6. Line Pressure Sensor (LPS)
  7. An additional (third) speed sensor
  8. A "squashed" or flatter torque converter
  9. A new cover for valve body access
  10. 23-way connector for the solenoid/pressure switch assembly
  11. A remote pinion gear


62TE

- A two-piece, closed differential case with structural clam-shell housing.

The addition of the underdrive compounder assembly components improves low-end torque multiplication, enhancing low-end power capability.

The Fluid

The 62TE requires +4 ATF. There are many different blends of ATF that meet the +4 requirement (markings for +4 are clear on the labels).

Service Fill Level: 5.5 qts/5.2L

Total Unit Capacity: 9.0 qts/8.5L

CLUTCH APPLICATION CHART									
ELEMENTS APPLIED									
GEAR	RATIO	UD	OD	R	2-4	L-R	LC	DC	ORC
1	4.127	A				A	A ^		H
2	2.842	A				A		A	
3 *	2.284	A			A		A ^		H
4	1.573	A			A			A	
4	1.452	A	A				A ^		H
5	1	A	A					A	
6	0.689		A		A			A	
R	3.215			A		A	A		

CHRYSLER AS68RC

Dodge trucks now offer two different automatic transmission packages:

1. AS68RC — Used in the cab-and-chassis field only (3500 series and larger)
2. 68RFE — Used in the 1500 and 2500 series trucks

The AS68RC is a 6-speed, rear wheel drive automatic transmission, with a 26,000 lb. gross capacity rating. With a rating this high, the torque converter and geartrain have to be extremely heavy duty. This unit is capable of standing up to 730 lb-ft of input torque, although Dodge rates the 3500 truck for 565 lb-ft of input torque. The unit weighs in at 400 lbs without the torque converter.

AS68RC

The Guts

The AS68RC is, for the most part, a clutch-to-clutch shifted transmission. But in drive range 1st gear, it does use a one-way sprag (F1) to launch. For engine braking while in 1st gear range, you'll need to place the shifter in manual 1. In manual 1, the B2 brake applies to provide engine braking, and the extra strength needed to prevent damage to the F1 sprag.

The B2 brake prevents the sprag from freewheeling. All other shifts (2nd, 3rd, 4th, 5th and 6th) are clutch-to-clutch shifts and will automatically provide a form of engine braking in each range.

The mechanical components of this transmission consist of:

- Three sets of driving clutch packs — K1, K2 and K3
- Two sets of holding brake packs — B1 and B2
- A one-way clutch — F1
- Three planetary gearsets — P1, P2 and P3
- An oil pump
- A torque converter with multi-disc lockup clutch (apply clutch pack, similar to the NAG1/722.6)
- A valve body
- Linear solenoids
- On/Off solenoids

Shift Lever Position	Description
P	Park and starting
R	Reverse gear
N	Neutral and starting. No power transmission takes place. The vehicle can be moved freely. Allows starting engine with the vehicle in motion.
D	All six forward gears are available (O/D not canceled and Tow/Haul not requested, off)
3	Upshifts only to 3rd gear. Provides engine braking.
2	Upshifts only to 2nd gear. Provides engine braking.
1	Drives only in 1st gear. Provides maximum engine braking.

Shift Lever Position		Gear Ratio	Driving Clutches K1	K2	K3	Holding Clutches B1	B2	F1
P	Park						A	
R	Reverse	3.54			A		A	
N	Neutral						A	
D	1st	3.74	A					A
	2nd	2.00	A			A		
	3rd	1.34	A		A			
	4th	1.00	A	A				
	5th	0.77		A	A			
	6th	0.63		A		A		
Man 1	1st Engine Braking		A				A	A

The Fluid

The AS68RC requires a special blend of fluid that's designed specifically for this unit. The bottles are clearly marked as *Mopar AS68RC Automatic Transmission Fluid.* It's available in quarts and gallons, and is the only fluid that should be used in this transmission (figure x).

Service Fill Level: 6.8 liters (7.2 quarts)

Total Unit Capacity: 14.2 liters (15.0 quarts)

The factory recommended service interval is 30,000 miles. The torque converter on the AS68RC fills in both park and neutral, so it'd be a good idea to fill it with the selector in park, to prevent any unexpected movement.

One of the nice features of the AS68RC is that it's equipped with a dipstick for checking the fluid level. But it does require a temperature-compensated checking procedure. Here's how to check and adjust the fluid level:

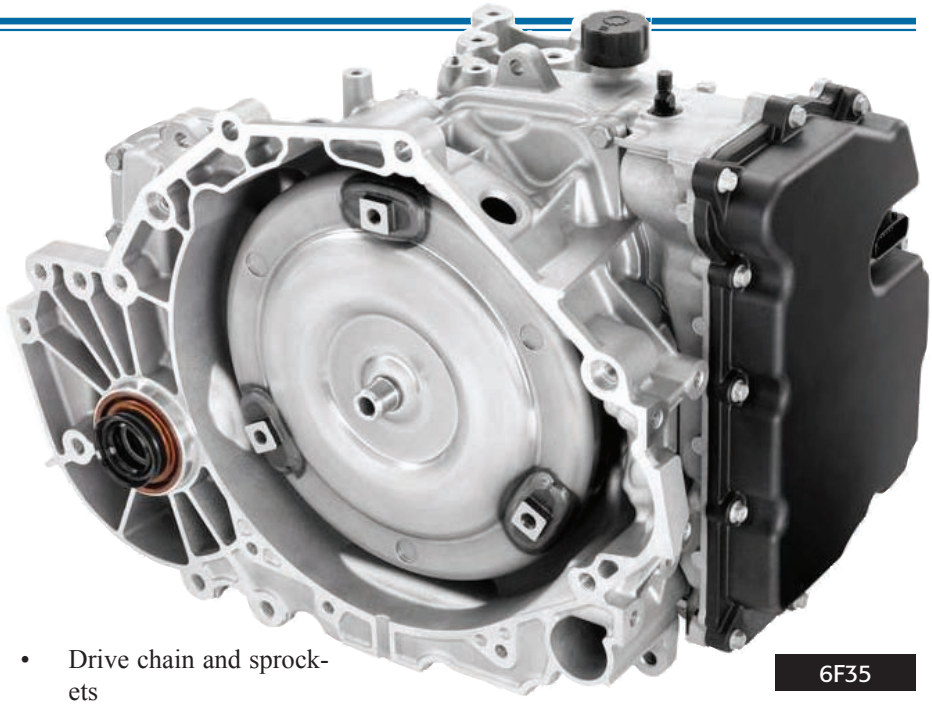
- Vehicle must be on level surface, in park, with the engine running.
- Cycle the shift lever through all gear ranges, pausing in each range for a few seconds.
- Use a scan tool to check the transmission temperature.
- Adjust fluid level as necessary.

Use the chart (figure xx) to determine proper fill. Best results are obtained at temperatures above 60ºC (140ºF).

FORD 6F35

The Ford 6F35 is a 6-speed transaxle with electronic shift control. This transaxle has a 4-element torque converter design, which includes a torque converter clutch (TCC) and a geartrain with three planetary gearsets.

It's designed for operation in a transverse powertrain for front wheel drive (FWD) and all-wheel drive (AWD) vehicles. Designated for the 2009 Escape, this unit's coverage is sure to expand like its big brother, the 6F50N.



6F35

The Guts

The hydraulic control system of the 6F35 uses seven electronically-controlled solenoids for:

- Shift feel (through line pressure control and shift pressure control)
- Shift scheduling and timing
- TCC operation

This transaxle uses these major components:

- Case with torque converter housing
- Two drive clutches:
  1. Direct clutch
  2. Overdrive (O/D) clutch
- Four brake clutches:
  1. Forward clutch
  2. Low one-way clutch
  3. Low/reverse clutch
  4. Intermediate clutch
- Three planetary gearsets:
  1. Front
  2. Center
  3. Rear
- Drive chain and sprockets
- Final drive planetary gearset and differential assembly
- Pump and filter assembly
- Main control:
  1. Valve body assembly
  2. Solenoid body assembly

The Fluid

To completely clean the torque converter, you'll need to drain and refill the unit three times:

1. Raise the vehicle, with the shifter in neutral.

NOTE: If you suspect an internal problem, drain the transmission fluid through a paper filter. A small amount of metal or friction particles is normal; if you find an excessive amount of metal or friction material, you'll need to rebuild the unit.

2. Remove the transmission fluid drain plug and allow the ATF to drain.
3. Reinstall the transmission fluid drain plug and tighten it to 9 Nm (80 lb-in).
4. Fill the transaxle with clean transmission fluid.
5. Start the engine and let it run for 3 minutes. Move the range selector lever slowly through each gear position.
6. Repeat steps 2, 3, 4 and 5 two more times.

After you've changed the transmission fluid three times, check and adjust the fluid level.

Shift Speeds 3.0L

Throttle Position	Range	Shift	KM/H	MPH
Light Throttle[a]	D	1-2	13-18	8-11
	D	2-3	19-26	12-16
	D	3-4	29-37	18-23
	D	4-5	45-56	28-35
	D	5-6	72-90	45-56
Medium Throttle[a]	D	1-2	32-42	20-26
	D	2-3	48-61	30-38
	D	3-4	63-82	39-51
	D	4-5	80-108	50-67
	D	5-6	117-159	73-99
Heavy Throttle[a]	D	1-2	58-72	36-45
	D	2-3	85-106	53-66
	D	3-4	126-156	78-97
	D	4-5	151-192	94-119
	D	5-6	217-261	135-162

a Do not exceed the speed limit.

Solenoid Operation Chart

Base Selector Lever Position	PCM Commanded Gear	Shift Solenoid					TCC (VFS) NL
		SSA (VFS) NL (CB 1,2,3,4)	SSB (VFS) NH (3,5,R)	SSC (VFS) NL (CB 2,6)	SSD (VFS) NH (CB L,R/C 4,5,6)	SSE (On/Off) NC	
P	P	Off	On	Off	On	On	Off
R	R	Off	Off	Off	Off	On	Off
N	N	Off	On	Off	On[a]	On[a]	Off
D	1	On	On	Off	On	On	Off
	2	On	On	On	On	Off	Off
	3	On	Off	Off	On	Off	Off
	4	On	On	Off	Off	Off	On/Off
	5	Off	Off	Off	Off	Off	On/Off
	6	Off	On	On	Off	Off	On/Off
L	L	On	On	Off	Off[a]	On	Off

a Solenoid state will change if vehicle is moving forward with the selector lever in the NEUTRAL position.

CB = Clutch brake
NC = Normally closed
NH = Normally high
NL = Normally low

Line Pressure Chart

Gear	Line
Pressures at Idle[a]	
P	338-379 kPa (49-55 psi)
R	621-689 kPa (90-100 psi)
N	338-379 kPa (49-55 psi)
D	338-379 kPa (49-55 psi)
L	338-379 kPa (49-55 psi)
Pressure at Wide Open Throttle (WOT) Stall[a]	
P	338-379 kPa (49-55 psi)
R	1,868-2,068 kPa (271-300 psi)
N	338-379 kPa (49-55 psi)
D	1,868-2,068 kPa (271-300 psi)
L	1,868-2,068 kPa (271-300 psi)

a All pressures are approximate.

Item	Specification	Fill Capacity
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLV	MERCON® LV	8.5L (9 qt)
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B	—

Gear Ratio Chart

Gear	Ratio
1st/low	4.584:1
2nd	2.964:1
3rd	1.912:1
4th	1.446:1
5th	1:1
6th	0.746:1
Reverse	2.94:1

Shift Speeds 2.5L

Throttle Position	Range	Shift	KM/H	MPH
Light Throttle[a]	D	1-2	11-16	7-10
	D	2-3	21-27	13-17
	D	3-4	29-37	18-23
	D	4-5	45-56	28-35
	D	5-6	72-90	45-56
Medium Throttle[a]	D	1-2	27-43	17-23
	D	2-3	42-55	26-34
	D	3-4	58-77	36-48
	D	4-5	77-106	48-66
	D	5-6	135-177	84-110
Heavy Throttle[a]	D	1-2	51-66	32-41
	D	2-3	79-100	49-62
	D	3-4	113-143	70-89
	D	4-5	150-190	93-118
	D	5-6	201-245	125-152

a Do not exceed the speed limit.

Clutch Application Chart

Gear	Direct (C 3,5,R)	Overdrive (C 4,5,6)	Forward (CB 1,2,3,4)	Low/ Reverse (CB L,R)	Inter-mediate (CB 2,6)	One-Way
1st			X	X[a]		X
2nd			X		X	O/R
3rd	X		X			O/R
4th		X	X			O/R
5th	X	X				O/R
6th		X			X	O/R
Reverse	X			X		

a Turns off above 6 km/h (4 mph).

CB = Clutch brake

O/R = Overrunning

FORD 6R80

The Ford 6R80 is the next intermediate-sized transmission to hit the streets. This 6-speed transmission's little brother, the 6R60, is fazing out and the 6R80 is taking its place.

The 6R80 is designated for the same applications as the 6R60: Explorer, Mountaineer, F150, Expedition and most other mid-sized SUVs.

The Guts

The 6R80 uses planetary gears with hydraulic/electronic controls. The Transmission Control Module (TCM) and the main control valve body form a composite element that's installed as a single unit inside the transmission.

It has these features:

- Six forward speeds
- Torque converter with an integral converter clutch sensor
- Electronic shift and pressure controls
- Single planetary gearset
- Double planetary gearset
- Two fixed, multidisc clutches
- Three multiplate clutches

All hydraulic functions are directed by electronic solenoids to control:

- Engagement feel
- Shift feel
- Shift scheduling
- Modulated Torque Converter Clutch (TCC) applications

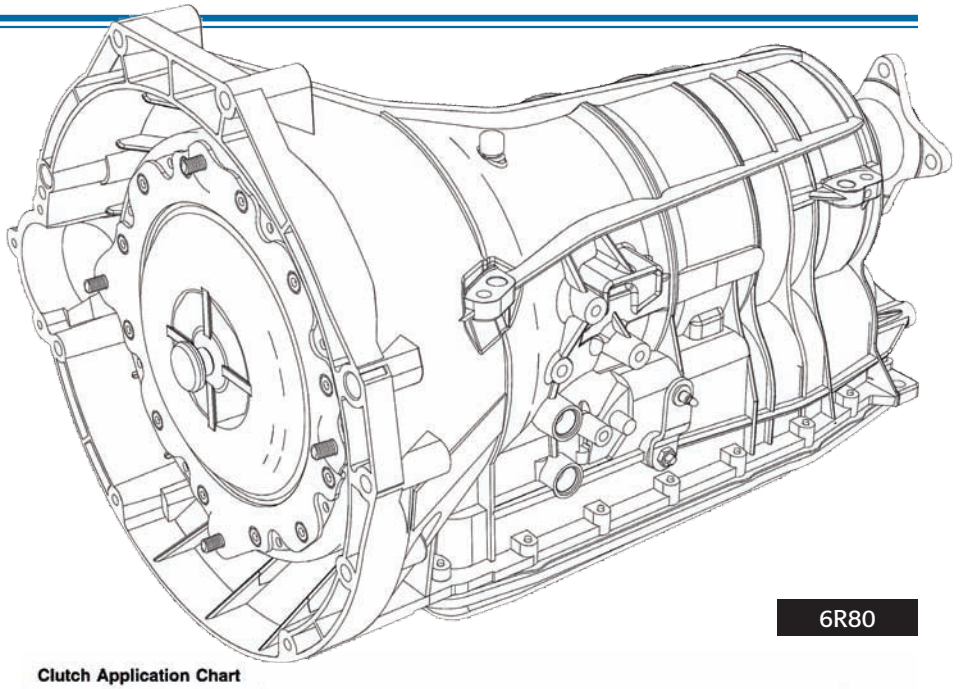
This transmission includes a Mechatronic unit — also referred to as a TCM — which contains:

- Turbine Shaft Speed (TSS) sensor
- Output Shaft Speed (OSS) sensor
- Internal P, R, N, D selector shaft position
- Transmission Fluid Temperature (TFT) sensor

The torque converter includes a converter clutch. Two planetary gearsets create six forward ranges and one reverse.

The Fluid

CAUTION: Always use the factory recommended fluid. Using anything other than the fluid specified can cause the transmission to fail or operate improperly.



6R80

Clutch Application Chart

Gear	SSA (VFS1) Proportional	SSB (VFS2) Inversely Proportional	SSC (VFS3) Proportional	SSD (VFS4) Inversely Proportional	PCA (VFS5) Inversely Proportional	TCC (VFS6) Proportional	SSE (SS1) ON/OFF
Park				X	a		
Reverse		X		X	a		
Neutral				X	a		
1st Gear Manual	X			X	a	a	
2nd Gear Manual	X		X		a	a	
3rd Gear Manual	X	X			a	a	
1st Gear D	X			X	a	a	
2nd Gear D	X		X		a	a	
3rd Gear D	X	X			a	a	
4th Gear D	X			X	a	a	X
5th Gear D		X		X	a	a	X
6th Gear D			X	X	a	a	X

a Transmission control module (TCM) controlled

1. Raise the vehicle with the transmission in neutral.
2. Remove the transmission fluid fill plug and fluid level indicator assembly located on the passenger side front of the case. This relieves any vacuum buildup in the transmission, making it easier to remove the pan.
3. Remove the pan and allow the fluid to drain.
4. Remove the pan gasket; if it isn't damaged, you can reuse it during reassembly.
5. Remove the transmission filter; you may reuse the filter if it isn't severely contaminated.
6. Clean and inspect the transmission fluid pan and magnet.

NOTE: If you're repairing the transmission for a contamination-related failure, install a new filter and seal assembly. You can reuse the filter if the unit isn't severely contaminated.

7. Check the transmission case for the filter seal. If the seal is in the case, carefully remove the seal without scratching the case.
8. Install the filter; make sure a new seal is on the filter and lubricate the seal with ATF.
9. Position the magnet in the transmission fluid pan.
10. Install the pan gasket.
11. Install the pan and tighten the bolts to 12 Nm (106 lb-in) using a criss-cross pattern.
12. Fill and check the transmission fluid.

FORD 6R80

- Continued -

Shift Speeds

NOTE: Shift speed ranges are approximate for all applications. For specific applications (engine, axle ratio, tire size and application), refer to the Automatic Transmission Specification booklet. Always drive the vehicle in a safe manner according to driving conditions and obey all traffic laws.

Throttle Position	Shift	MPH	Km/H
Light Throttle	1-2	8-13	13-21
Throttle Position Sensor Voltage	2-3	16-21	26-34
	3-4	22-27	35-43
	4-5	35-40	56-64
1.25 Volts	5-6	44-49	71-79
Closed Throttle	6-5	35-40	56-64
	5-4	25-30	40-48
	4-3	8-13	13-21
	3-2	2-7	3-11
	2-1	1-4	2-6
Wide Open Throttle	1-2	28-33	45-53
	2-3	54-59	87-95
	3-4	87-92	140-148

Gear Ratio	
1st	4.17 to 1
2nd	2.34 to 1
3rd	1.52 to 1
4th	1.14 to 1
5th	0.87 to 1
6th	0.69 to 1
Reverse	3.40 to 1

Material

Item	Specification	Fill Capacity
Dye-Lite® ATF/Power Steering Fluid Leak Detection Dye 164-R3701 (Rotunda)	—	—
Motorcraft® MERCON® LV Automatic Transmission Fluid XT-10-QLV	MERCON® LV	10.4L (11 qt)
Multi-Purpose Grease XG-4 and/or XL-5	ESB-M1C93-B	—

Clutch Application Chart

Gear	Forward (A)	Direct (B)	Intermediate (C)	Low/Reverse (D)	Overdrive (E)
Park				X	
Reverse		X		X	
Neutral				X	
1st Gear Manual	X			X	
2nd Gear Manual	X		X		
3rd Gear Manual	X	X			
1st Gear D	X			X	
2nd Gear D	X		X		
3rd Gear D	X	X			
4th Gear D	X				X
5th Gear D		X			X
6th Gear D			X		X

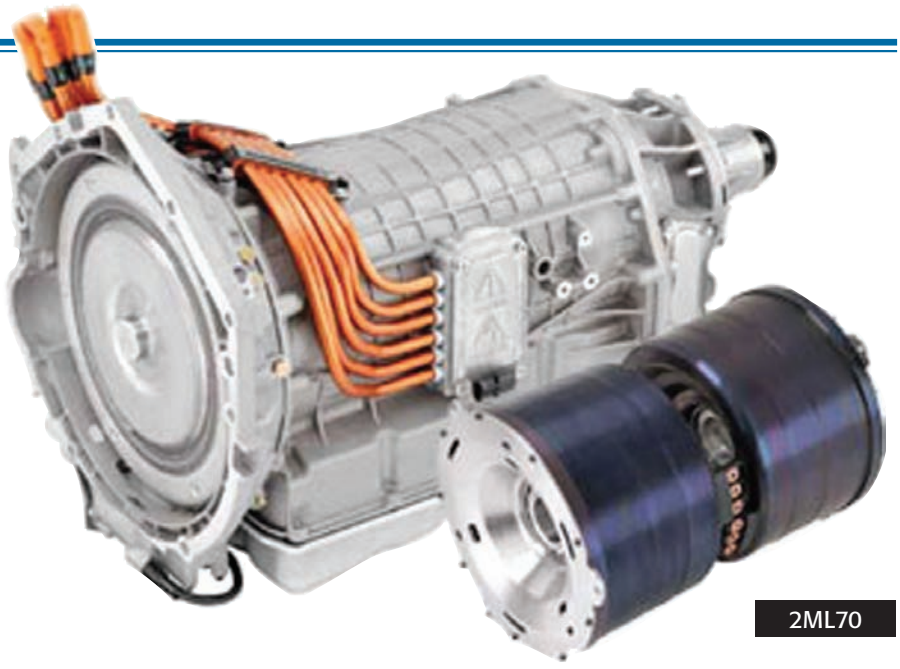
GM 2ML70

The next generation of transmissions to enter the marketplace has been introduced for the 2008 model year. Known as a *2-mode* design, the transmission was designated as the 2ML70 (RPO M99).

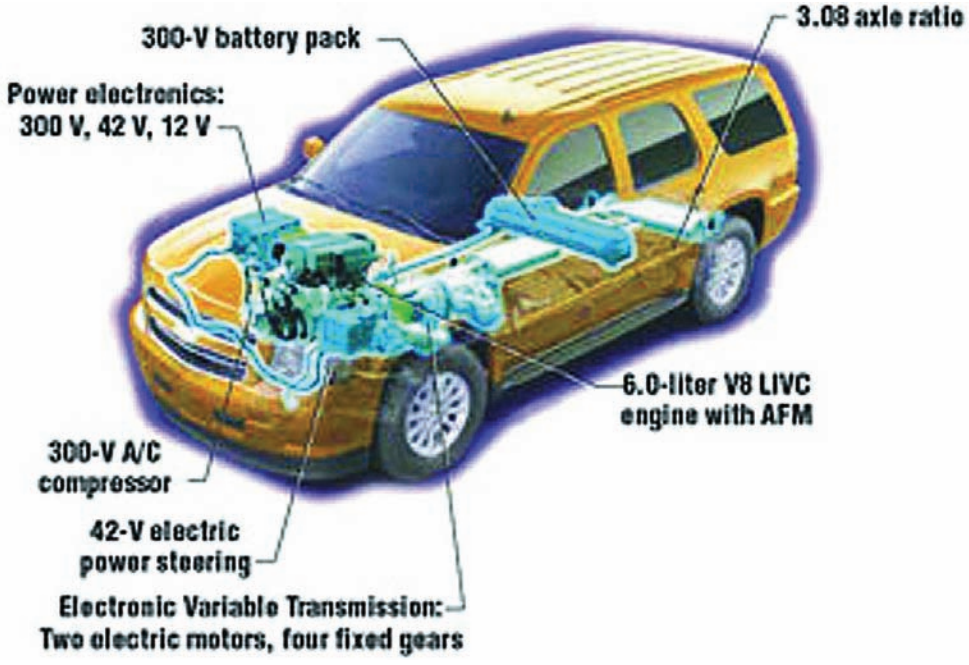
The 2ML70 is available with the 6.0L engine (RPO LFA) and the hybrid system (RPO HP2). The 2-mode system was introduced on the Chevrolet Tahoe and GMC Yukon for the 2008 model year. Its use will expand for 2009.

The "T" model transmission will be designated for rear wheel drive applications, the "C" model will be an upscale rear wheel drive application, while the "F" model will be a front wheel drive application. The 2ML70 is also used by Dodge and BMW in some of their vehicles.

The 2-mode design offers several advantages over conventional automatic transmissions, including substantial gains in performance, fuel economy, and significant emissions reduction. Overall fuel economy gains for the C/K truck ranges between 25-40%. In addition to the common transmission functions, the 2ML70 also eliminates the need for an alternator or starter.



2ML70



The Guts

The 2ML70 is a 2-mode, continuously variable, electric ratio hybrid transmission with four fixed gear ratios. Two electric motors provide infinitely variable ratios, with engine on/off operational capability.

- Gear Ratios
  - 1st — 3.69:1
  - 2nd — 1.70:1
  - 3rd — 1.00:1
  - 4th — 0.73:1

  EVT #1 Infinity to 1.70:1
  EVT #2 1.70 to 0.50:1
  Reverse Infinity to 1.70:1
- Max engine torque 380 lb-ft (515 Nm)
- Max engine power 369 bhp (275 kW)
- Two 65 kW (peak) electric motors (Drive Motor #1, Drive Motor #2); Y-wound, 3-phase, 300 volts AC, permanent magnet
- Motor cooling accomplished by a transmission fluid circulation system
- Electric motor torque 242 lb-ft (320 Nm)
- 300-volt, 40-cell nickel-metal-hydride battery (located under the back seats)
- Auxiliary fluid pump
- Three planetary gearsets
- Four multiple-disc clutches (2 holding, 2 driving)
- Two shift solenoids used (On/Off design): SS1,SS2
- Six variable bleed solenoids: PCS, PCS2, PCS3, PCS4, PCS5, TCC (TCC not used)

The Fluid

This unit is filled for life and doesn't require replacement.

WARNING: Servicing a 2-mode vehicle or transmission requires specialized training. Failure to follow proper safety procedures can cause injury or death. Some basic service procedures:

- Pay close attention to all Hazard Labels.

Hazard labels identify where potential shock hazards may occur. Areas include the transmission, high voltage cables (orange or blue), hybrid battery, DMGCM, PIM, APM, A/C compressor, and so on.

GM 2ML70

- Continued -

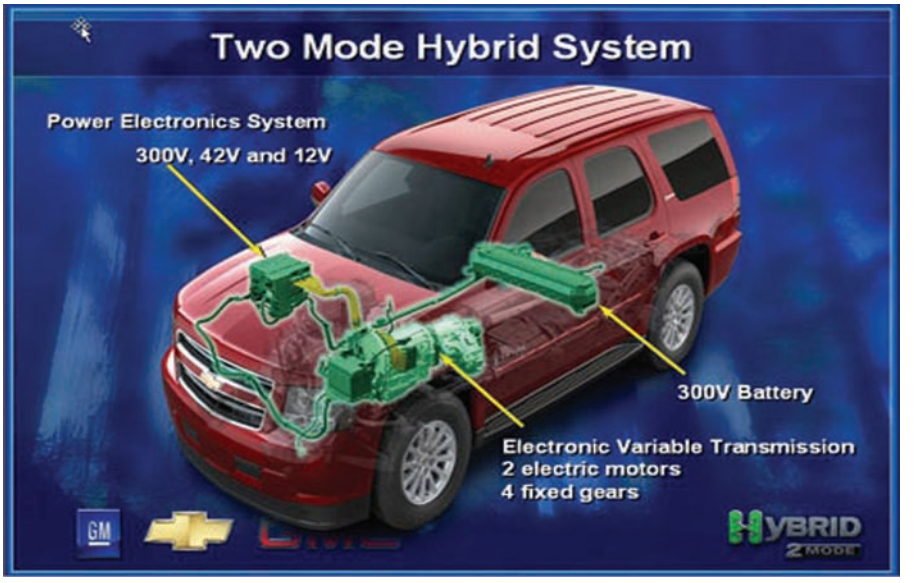
- Always use personal protective equipment.

Class 0, 1000-volt electrical protective gloves are *required*. Always check the expiration date on gloves; never use gloves after their expiration date. Always check the gloves for pinholes and general overall condition.

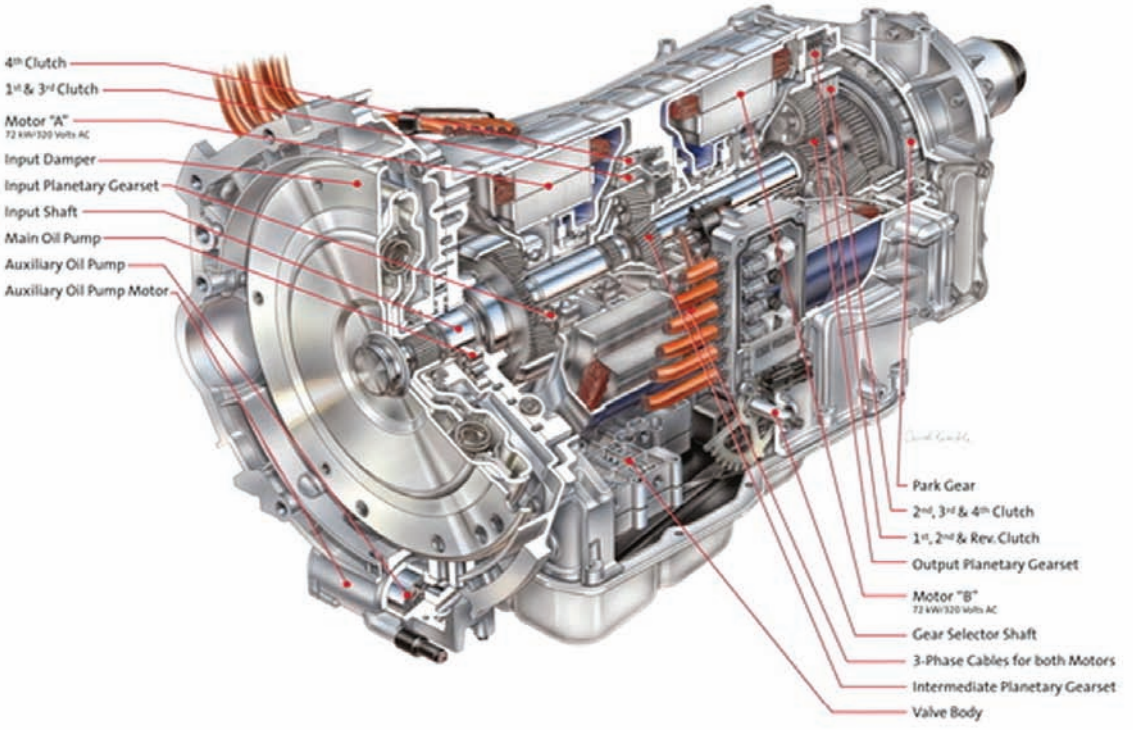
- Always wear proper eye protection.

Your digital multimeter and leads must meet or exceed category 3 or 1000-volt specifications.

- Never place both hands across vehicle components. Touching the wrong exposed terminals or leads may lead to injury or death. Use the *One-Hand Rule* — Only use one hand for diagnosis and repair when possible. Keep the other hand behind your back.
- Remove *all* jewelry, belt buckles, watches and other metal items before servicing these vehicles.
- Any time you disconnect high voltage leads, always insulate the ends using GM tools EL-48569 or UL-listed isolation tape rated at 600 volts or more.
- Always torque all high voltage terminals to specifications.
- Never use AC-powered test equipment to probe the high voltage system.
- Before servicing any high voltage systems — including the transmission — *always disable the system using the this procedure:*
  - o Remove the ignition key.
  - o Remove the cover from the passenger side of the hybrid battery assembly.
  - o Remove the high voltage manual disconnect lever.
  - o Wait at least 5 minutes for the system capacitors to discharge.
  - o Disconnect the vehicle's 12-volt battery.



2-Mode RWD Hybrid Transmission



GM 6T40/6T45

Two additional 6-speed transaxles have been introduced into the GM family: the 6T40 and 6T45. Known as the *global 6-speed* or GF6, the 6T40/6T45 improves fuel economy an average of 4% and performance 8% over its 4-speed cousins. The 6T40/6T45 share the same architecture and most of the parts are the same.

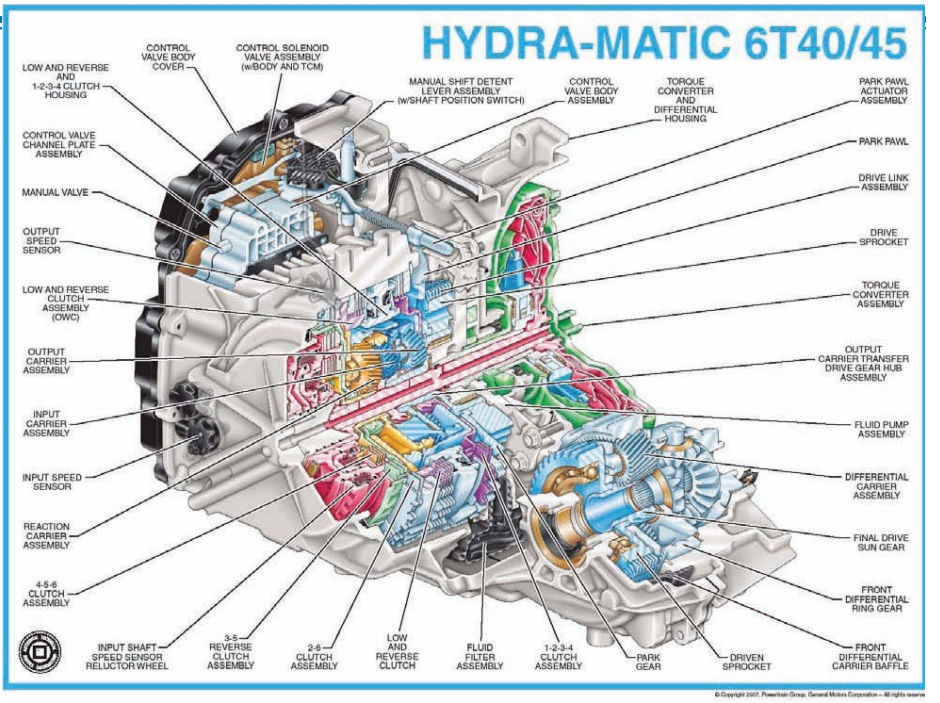
The first car to receive this transaxle in the United States was the 2008 Chevrolet Malibu, followed by the 2009 Saturn Aura and Pontiac G6. It's also the primary application for the Daewoo Tosca and Buick Lacrosse in Asia, and the Chevrolet Epica in Europe.

The 6T40/45 family of transaxles is poised to become the largest 6-speed FWD application that GM will produce. In the US market the transaxles will be fitted behind gas engines, while those destined for the European markets may be used with diesel engines.

The Guts

The primary difference between these two units is the 6T45 is a heavy-duty version of the 6T40. The heavy-duty parts in the 6T45 include:

- 1.25" wide chain verses a 1" chain
- Input planetary is a 5-pinion assembly
- Heavier ribbed case
- Heavier differential



Checking Fluid Level

The 6T40/45 use a thermal element to control the oil level, similar to other GM units. Known as a *Fluid Level Control Valve,* the unit is basically a thermally-controlled stand pipe.

At temperatures below 60ºC (140ºF), fluid is allowed to drain into the sump.

At temperatures above 60ºC (140ºF), drainback is blocked, allowing the side cover (valve body area) to fill with fluid. If you're changing fluid in one of these units, make sure the unit is cold.

If you remove the drain plug in the bottom of the case, only about 50% of the fluid will drain out of the unit. You'll need to remove the bottom pan to drain the unit completely.

To check the fluid level, the transaxle TFT value must fall between 85º–95ºC (185º–203ºF). You can check the fluid temperature from the Driver Information Center or with a scan tool.

Checking the fluid at the wrong temperature can cause you to overfill or underfill the transaxle. These units are very sensitive to overfill. As little as ½ quart overfull can lead to fluid leaking from the vent.

Check the fluid level with the engine running, fluid temp 85º–95ºC (185º–203ºF), and transaxle in park. Then check the fluid level via a plug (most applications) near the axle seal in the case.

RANGE REFERENCE 6T40/6T45

COMPONENT	PARK NEUTRAL	REV	1ST BRK	1ST	2ND	3RD	4TH	5TH	6TH
1-2-3-4 CLUTCH			ON	ON	ON	ON	ON		
3-5 REV CLUTCH		ON				ON		ON	
4-5-6 CLUTCH							ON	ON	ON
LOW/REV CLUTCH	ON	ON	ON						
2-6 CLUTCH					ON				ON
LOW ONE WAY			ON	ON					

NOTE: The Low/REV clutch is applied when the vehicle is in a forward range and the vehicle is stationary. As vehicle speed is indicated, the L/R clutch will be released. This increases torque capacity under load with the vehicle stationary

IMPORT: MERCEDES 722.9

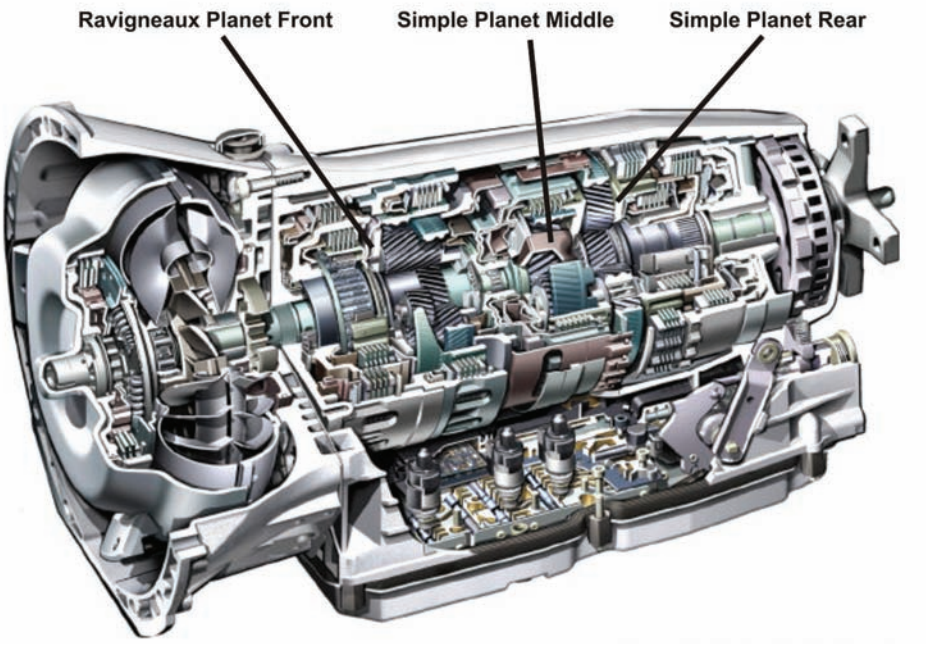
The 722.9 has been around since the later part of 2004, but there isn't much information available about it. Along with seven forward speeds, this unit also has two reverse gear ratios (similar to the 722.6), depending on whether it's in Sport or Comfort mode. This 5th generation transmission is the first 7-speed automatic produced by Mercedes Benz. The Mercedes designation for this transmission is New Automatic Gearbox 2 (NAG2) or 7G–Tronic.

The 722.9 is available in these vehicles:

- 2004–06 SL500
- 2005–up CL500, E500, S430, 500, SLK350, 55 AMG
- 2006–up C230, 280, 350, CLK350, CLS500, E350, E63 AMG, R350, 500, SLK280
- 2007–up CLK550, CLS550, CL600, CLS63 AMG, E550, E63 AMG, GL320, 450, ML350, 500, ML63 AMG, R63, and S550.

The Guts

- 4 multidisc brakes
- 3 multidisc clutches
- No sprag



Gear ratios are achieved with one Ravigneaux and two simple planetary assemblies shown in figure x. Unlike the Lepelletier geartrain, the 722.9 geartrain has the sun gear fixed to the K1 clutch assembly. Although located in the front of the unit (figure x), the Ravigneaux planetary assembly is also located in the front section of the transmission (figure x). There are two simple planets located toward the back of the transmission, one in front of the other.

The Fluid

The 722.9 requires a newly developed, suggested-use-only transmission fluid, referred to as *ATF 3353*. It claims higher friction consistency, thermal stability and temperature rating, and can be used on previous model 722.3/.4/.5/.6 transmissions. No scheduled maintenance required (fill for life) and the fluid is available at Shell and Fuchs Europe oil suppliers in 1-liter bottles under Mercedes Benz

Shift Member		B1	B2 *	B3	BR *	K1	K2	K3
Shift Valve		Y3/8y5	Y3/8y6	Y3/8y7	Y3/8y6	Y3/8y2	Y3/8y3	Y3/8y4
Valve State		Pressure / Current	Pressure / Current	Pressure / Current	Pressure / Current	Pressure / Current	Pressure / Current	Pressure / Current
Gear	Ratio	◣	◢	◢		◢	◣	◣
1	4.377	C=Max / P=0	X / C=V / P=V	X / C=V / P=V		C=0 / P=0	C=Max / P=0	X / C=V / P=V
2	2.859	X / C=V / P=V	X / C=V / P=V	C=0 / P=0		C=0 / P=0	C=Max / P=0	X / C=V / P=V
3	1.921	C=Max / P=0	X / C=V / P=V	C=0 / P=0		X / C=V / P=V	C=Max / P=0	X / C=V / P=V
4	1.368	C=Max / P=0	X / C=V / P=V	C=0 / P=0		X / C=V / P=V	X / C=V / P=V	C=Max / P=0
5	1	C=Max / P=0	C=0 / P=0	C=0 / P=0		X / C=V / P=V	X / C=V / P=V	X / C=V / P=V
6	0.82	X / C=V / P=V	C=0 / P=0	C=0 / P=0		C=0 / P=0	X / C=V / P=V	X / C=V / P=V
7	0.728	C=Max / P=0	C=0 / P=0	X / C=V / P=V		C=0 / P=0	X / C=V / P=V	X / C=V / P=V
N (1)		C=Max / P=0	C=0 / P=0	X / C=V / P=V	C=0 / P=0	C=0 / P=0	C=Max / P=0	X / C=V / P=V
N (2)		X / C=V / P=V	C=0 / P=0	C=0 / P=0	C=0 / P=0	C=0 / P=0	C=Max / P=0	X / C=V / P=V
R (1)	-3.416	C=Max / P=0	see BR	X / C=V / P=V	X / C=V / P=V	C=0 / P=0	C=Max / P=0	X / C=V / P=V
R (2)	-2.231	X / C=V / P=V	see BR	C=0 / P=0	X / C=V / P=V	C=0 / P=0	C=Max / P=0	X / C=V / P=V

X = Shift member applied C = Current applied to solenoid valve P = Pressure from solenoid valve to shift member (0 = zero / V = variable / Max = maximum)

* B2 and BR share the same solenoid valve, the oil is directed to a different member via the selector shift valve.

◢ No current = no pressure
◣ No current = max. pressure

(1) = S mode
(2) = C mode

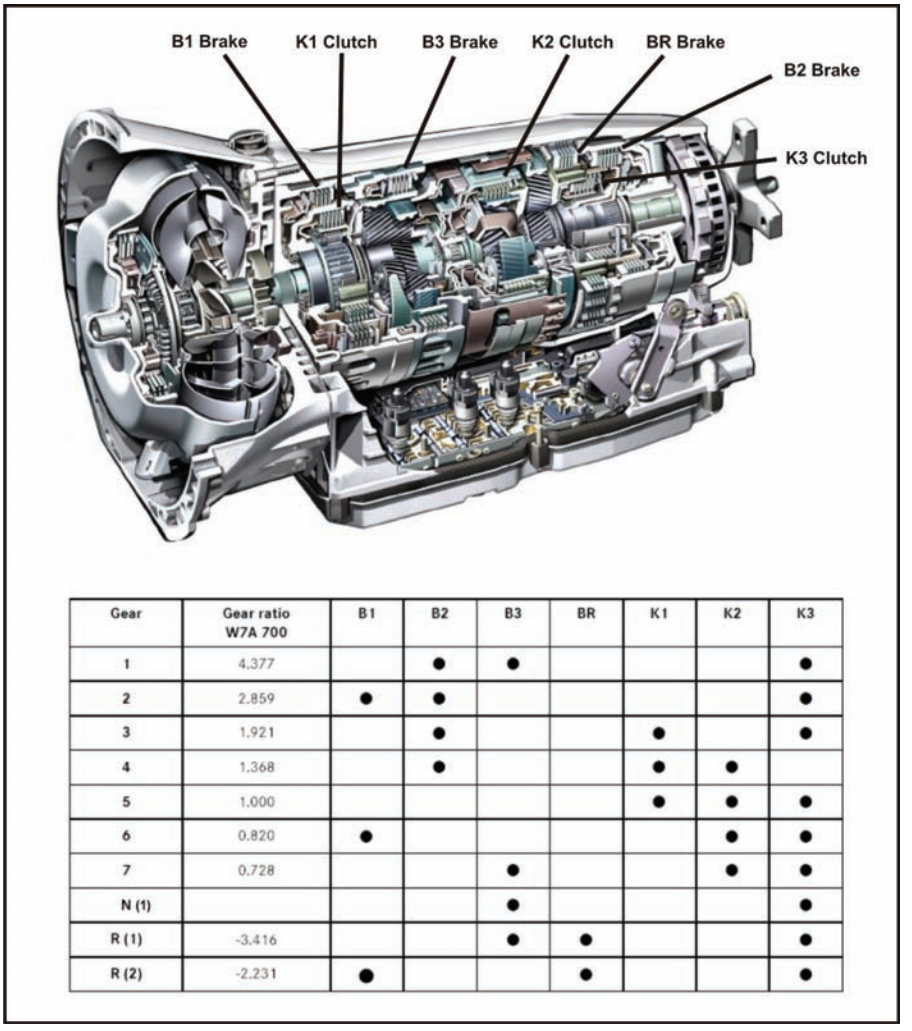
If transmission enters emergency mode while driving, all solenoid valves are switched off. Trans will shift into 6th gear.
? This is because the solenoid valves for B1, K2 & K3 deliver max pressure with no current applied.
? After engaging P position, then D position; only 2nd and R gear is available.

IMPORT: MERCEDES 722.9

- Continued -

part number A001 989 45 03 10.

This transmission has no dipstick. The fluid level is checked using the overflow method. The oil pan has an overflow pipe clipped onto the pan, just above the drainplug. The fluid level must be checked at a specific fluid temperature.



Gear	Gear ratio W7A 700	B1	B2	B3	BR	K1	K2	K3
1	4.377		●	●				●
2	2.859	●	●					●
3	1.921		●			●		●
4	1.368		●			●	●	
5	1.000					●	●	●
6	0.820	●					●	●
7	0.728			●			●	●
N (1)				●				●
R (1)	-3.416			●	●			●
R (2)	-2.231	●			●			●